THROVGH THE AGES

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VOL. 3 MAY, 1925 NO. 1

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A corner of the lobby of the General Motors Building, Detroit.
The main entrance doorways are of Tennessee marble
elaborately carved, after an old Roman design.

THROVGH THE AGES

A Monthly Magazine devoted to the uses of Marble - its universal adaptability, beauty, permanency and economy.

VOL. 3 MAY, 1925 NO. 1

THE FIRST NATIONAL BANK OF DETROIT

A Twenty-five Story Office Building that is the Tallest in Michigan

STAMPED indelibly against Detroit's skyline, there rears a gigantic white structure of stone and steel that reflects the sun's rays through the city's main arteries as they radiate outward like the spokes of a mammoth wheel. This building, the home of the First National Bank, stands as a finished monument to the living, enterprising spirit of commerce and citizenship in Detroit.

Years ago Oliver Wendell Holmes, that virile writer of the early nineteenth century, penned these lines:

"Build thee more stately mansions, O my soul,
As the swift seasons roll!
Leave thy low-vaulted past!
Let each new temple, nobler than the last,
Shut thee from heaven with a dome more vast,
Till thou at length art free,
Leaving thine outgrown shell by life's unresting sea!"

Like the chambered Nautilus, the First National Bank has outgrown its shell and has built for itself a home big and fine enough to enable it to fulfill its obligation to the community of which it has become so important a part.

Embodying the life effort of men who have pursued an ideal, and built upon historic ground, it is a tribute to men and motives, architect and artisan, science and success.

The streets of Detroit were originally laid out from the Campus Martius as a hub. Along one of these spokes, to the eastward, was left a market place, named Cadillac Square, in honor of that hardy explorer Count de la Mothe Cadillac, the founder of the city. From the day when gun and arrow fought for supremacy, to the era of barter between traders and merchants, and down to the present time, Cadillac Square has been the commercial heart of Detroit.

Upon the half-acre at the corner of Woodward Avenue and Cadillac Square stood the famous old Russell House, a hostelry that entertained the celebrities of the past. About the time that the motor car industry began to spread out the city's boundaries, and thriving manufacturing plants and increas-

The First National Bank Building is in the heart of business Detroit.

ing population gave a new importance to Detroit, a new hotel was erected on the site —the Pontchartrain.

With the passing of a decade, this hotel found that the standards of modern inn keeping had changed and it was no longer possible to continue on a profitable basis. Reconstruction was out of the question. The location was sold to the First and Old Detroit National Bank, and the present structure was completed in June of 1920.

The First National Bank in Detroit is the outcome of the amalgamation of several of the city's largest banks. The original First National opened its doors in 1863 in the Rotunda Building at Griswold and Larned Streets. Successive consolidation with the State Bank of Michigan, in 1864; the National Insurance Bank in 1869; the Old Detroit National Bank, in 1914; and finally, the Central Savings Bank, in 1920, gave an importance to the institution and an impetus to its resources that have placed it in the front rank of Michigan financial organizations.

The architect of the new building was Mr. Albert Kahn, of Detroit. The structure has an exterior of classic lines; the tip of the parapet on the twenty-fifth floor towers 312 feet above the street level, with graceful Corinthian columns supporting tier upon tier of stone blocks. It faces 161 feet on Woodward and 187 feet on Cadillac Square; its size, however, is difficult to realize be-

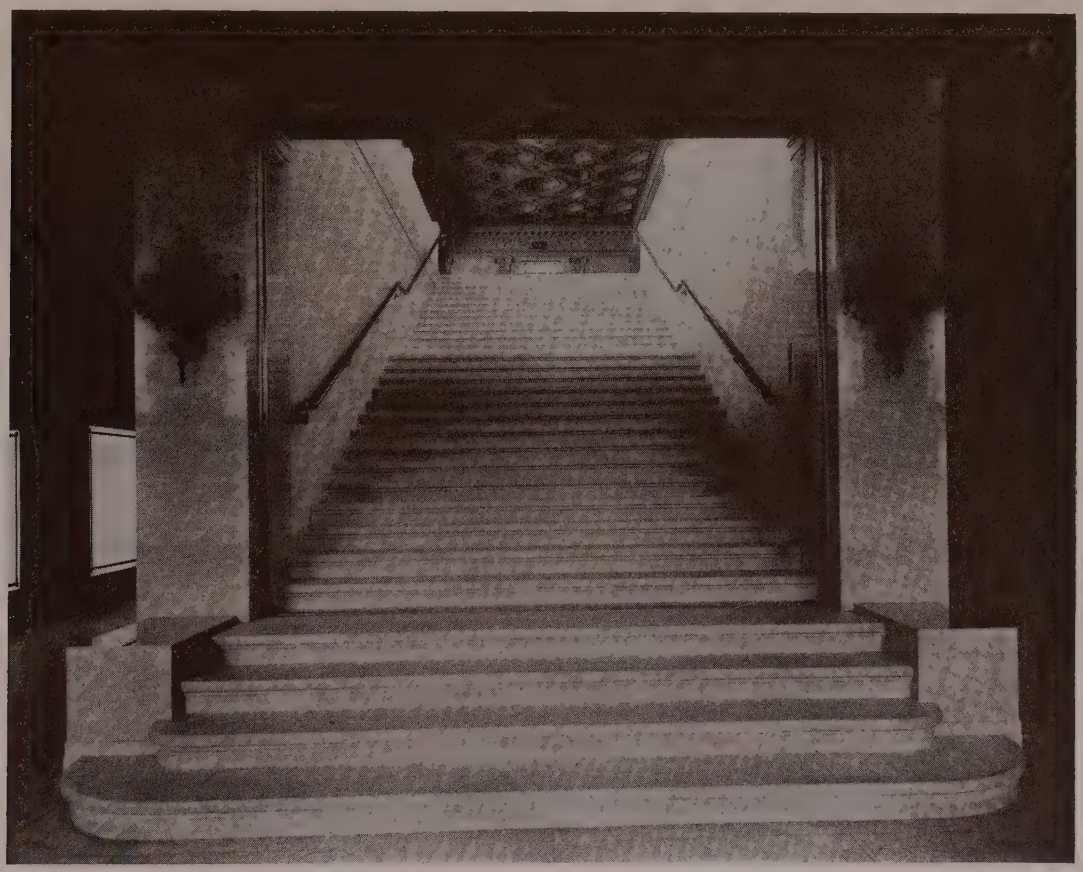
cause of the openness of its location. Seen from the sidewalk at its base, looking along the walls skyward, its huge bulk is more readily appreciated. Those who have gone to the roof on a clear day and viewed the city and country for miles around, have comprehended it even more fully.

Reaching down into the earth 84 feet, 74 bell-shaped concrete shafts, each 5 to 9 feet in diameter, form the rock-like foundation of this tallest building in Michigan. The lowest level of the building proper is 35 feet underground, there being three floors below street level.

Thousands of tons of steel columns and beams, fabricated as perfectly as a spider's web, hold rigid the mantle of stone, wood, marble, plaster, tile and brick.

Three entrances from Woodward Avenue open into the main lobby 40 feet in width and running back 85 feet to the Cadillac Square entrance on the left. At the far end of the lobby, doors lead into the Central Savings Bank and Foreign Department of the First National Bank. At the right is the U-shaped lobby from which a battery of ten passenger elevators operate at a lifting speed of 700 per minute.

From the center of the main entrance, a stately marble stairway leads to the banking chambers of the First National Bank. This stairway is 12 feet wide, of easy rise, with wainscoting and balustrades of Botticino, and the treads and risers of light gray Tennessee marble. In the banking room itself, Botticino Italian marble pillars rise to a



View up the main staircase, leading to the banking auditorium. Tennessee and Botticino marbles formed an effective combination.

The entrance from the elevators to the lobby of the main banking room.

height of 36 feet, supporting a handsome frieze blending in with the ceiling, which is artistically decorated in rich colors patterned into a Renaissance design.

A bronze grill fashioned into the same period design and mounted on a marble base forms the tellers' cages which flank the spacious room on three sides.

Mammoth windows, extending the entire height of the chamber, form the back wall of this lane. Flooded with daylight, the reception and disbursement of funds are thus carried on easily and efficiently.

There are eight main steel girders supporting the ceiling over the main banking auditorium. Each of these girders spans a length of 41 feet 8 inches from column to column. They measure 8 feet 4 inches in height from top to bottom. The weight of one of these beams alone is approximately 64,000 pounds. Each one separately will carry a load of approximately 1,400,000 pounds.

In the very center of this huge auditorium, an oval-shaped railing with marble spindles forms an island in which the operating officers are conveniently located to meet the bank's clients. At the east end, other officers have their desks on an elevation, to either side of which are the private offices of the president and senior vice-president.

The floor of the banking room is of Tennessee marble —some 64,000 square feet of it. The wainscoting of the walls, the panelling under the tellers' cages, as well as the columns, are of buff Botticino marble, of selected slabs.

The new business, advertising, legal, credit and service departments are located on the mezzanine floor, which is to the south of the main banking chambers. Here is also the bank library where reference may be made to the many volumes of books, magazines and literature pertaining to business subjects.

The second mezzanine or fourth floor is given over to the women of the affiliated

companies and provides a rest room, locker room, wash room and infirmary. Everything in the way of complete and sanitary equipment as well as comfortable furnishings makes this section a complement to the organization.

The fifth floor is the "workshop" of the bank; here is provided an ideal spot for hundreds of people and machines to handle almost noiselessly the records of this great financial institution. All the mail is sorted, books kept, statements prepared, audits made, checks handled and the bank's clearing house operated from this department.

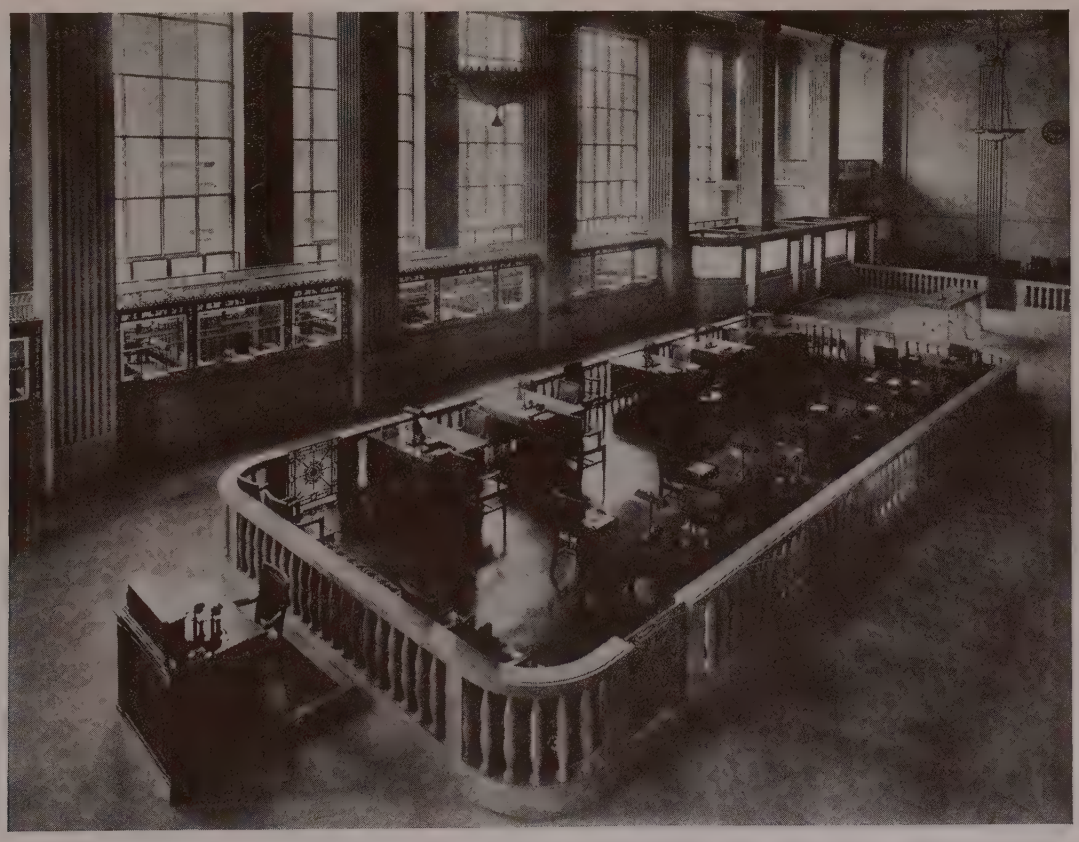
On the southeast corner of the sixth floor is located the directors' room. American walnut paneling, a beautiful marble fireplace and distinctive chandeliers make this one of the most beautiful rooms in the bank.

On the same floor is the officers' private dining-room; also a special dining-room, and two rooms which may be used as conference rooms by customers who may wish to hold meetings requiring such facilities. On the sixth floor are the offices of the building superintendent.

Up on the eighth floor are the offices of the First National Company of Detroit, which in every detail are in keeping with the executive quarters of the First National Bank.

Special elevators and two separate stairways are part of the provisions for rapid communication with the respective institutions and their departments.

There are eight vaults throughout the bank. In addition to the safe deposit and currency vaults, there are a late-deposit



Officers' island in the banking auditorium as seen from the mezzanine floor. The walls, floor and balusters are marble.

vault, an auditor's vault, a bookkeeping vault, a securities vault, an abstract vault and a bond department vault, all located conveniently for the use of those departments.

These vaults are the first in the West to be built in accordance with the findings of the Federal Reserve Board after months of experimental research and study resulting in the selection of the best type of construction. They are built of reinforced concrete and lined with armor plate. Seven miles of fine copper wire with a lead coating are woven throughout the side walls, ceiling and floor of the vaults.

This wire is charged with electricity so that the moment it is tampered with or broken by anyone seeking access through the wall, an extensive system of gongs is set ringing throughout the building and at police headquarters.

Washed air and a complete ventilating system make the basement floors as habitable as those above the street level.

Approximately 225,000 square feet of rentable area for general office purposes occupies the portion from the eighth to the twenty-fifth floors.

It is conservatively estimated that some 12,000 people enter and leave the First National Bank Building every week day—truly a sizable city in itself.

Detail showing tellers' cages in the First National Bank of Detroit. The floor is Tennessee; the panelling and wainscoting are of Botticino marble.

Fountain in the Villa d'Este, at Tivoli.

ITALIAN RENAISSANCE FOUNTAINS

IT has become fashionable of late years to be familiar with the old gardens and fountains of Italy, and there have appeared several elaborate volumes illustrating and describing them in detail. The architect can delve with profit into this phase of Italian art, for there is more to be learned by a careful study of the subject than is apparent at first sight.

The Romans built villas long before the sixteenth century. There was erected, for instance, more than 100 years before Christ, the Villa Adriana at Tivoli; almost on the site of the modern Frascati was Tusculum, a popular summer resort of classic times. Pliny and Mummius possessed villas of size and importance, and there were many others of an early date.

With the coming of the Dark and Mediæval Ages, there was developed the habit of fortifying the country house against enemies and this state of affairs was naturally reflected in the waning of the garden cult. The maintenance of a small vegetable patch was about all that was ever attempted and even this was a precarious matter. The massive

Illustrations courtesy of Thomas Machen, architect, Baltimore, Maryland.

Fountain delle Terme, Rome.
A Naiad.

Fountain dei Fiumi in the Piazza Navona, Rome.

Fountain delle Tartarughe, Rome, by Landini.

Fountain della Rocca, by Vignola, at Viterbo.

Fountain in the Villa Torlonia, at Frascati.

basements of the later Frascati villas, which were constantly subject to the raids of the hill bandits of the vicinage, were the outcome of such conditions.

The custom of erecting villas on the hills surrounding Rome was the logical result of the malarial conditions that prevailed in Rome during the summer months—and still persist to some extent in spite of the precautions of later day science. Since the disease is associated with low lying and marshy tracts, the villas were always built on the lofty slopes close by or on the more distant heights of Frascati.

The position on the site was usually handled with considerable skill. "An axial line," says Briggs, "is usually taken from the main entrance to the grounds through the center of the house and beyond, and a formal treatment is adopted. But the whole triumph of this Italian garden design lies in its adaptation of nature to a conventional treatment, for . . . . the object of the Italians was not to create nature but to adorn it."

The architect led one by gentle stages from the saloons of the house to a formal terrace, adorned with statues and balustrades, and thence through a formal ilex-hedged walk to a rustic wilderness of woods beyond. As we have remarked in a previous article, the brilliant Italian sun was responsible for an almost complete absence of flowers. In their place were demanded two things in the garden—shade and running

water. The first was not a difficult matter to provide, but the services of a hydraulic engineer was as much a necessity as the work of an architect.

The assignment of the water engineer was more than to supply water for the cascades and fountains of every kind, though these were prominent features in all the gardens; in many cases he was called upon to originate quaint conceits for the amusement and surprise of the delighted guests, oftimes resulting in generous dousings to the more unsuspicious. These wettings were taken without resentment, in keeping with the broad humor and slap-stick comedy of the day. Evelyn's diary at Tivoli some years later speaks of the "many devices to wet the unwary spectators, so that one can hardly walk a step without wetting to the skin." Montaigne tells us of organs played by water, the appearance of chirping birds and owls, and of many scientific tricks. Elsewhere we read of a house party, watching a sunset on a collapsible island near Isola Bella, which almost came to a tragic end when the whole group began sinking beneath the waters of the lake and drowning was imminent.

The many villas of Frascati form the best group in Italy and exhibit a variety of design. The Villa Aldobrandini we have already mentioned; others of importance are the Villa Torlonia, with its beautiful reservoir surrounded by balustrades, supplying a

Cascade in the Villa Lante, at Bagnaia; usually attributed to Vignola.

Cascade in the Royal Gardens at Caserta. The figures are all of white marble from the quarries at Carrara.

cascade that descends in curious ramps; the Villas Falconieri, Mondragone, Lancellotti and Mufti show excellent garden architecture. In all of them may be seen much that does not reflect glory on the Baroque architects, vulgarities and eccentricities that are inexcusable. We must bear in mind, however, that Italian Garden craft evolved about the time that the Baroque influence began.

The same thing may be said of the numberless fountains that are scattered so profusely about Italy and especially along the sun-scorched streets of Rome. No city anywhere has more of them and no city needs them more. Credit for most of these must be given to the seventeenth century Popes and their architects. Each new pontiff endeavored to surpass his predecessor in the size and magnificence of the aqueduct he brought into the city. The huge Aqua Paola on the Janiculum is the largest of these; it was designed by Domenicus Fontana and finished by Maderna in 1612.

The Fontana di Trevi, the work of Ferdinand Fuga, is so fine and so much bolder in its style than suggested by its date (1735-62) that it is sometimes attributed to Bernini. It is built of Travertine stone and when first planned, permission was actually secured to use the stone contained in the tomb of Cecilia Metella, which had already had a narrow escape, and which was only saved now by violent resistance on the part of the people of Rome.

Bernini was the author of several foun-

tains that are objects of interest to the tourist. The principal ones are the Fontana dei Fiumi in the Piazza Navona, the Acqua Acitosa, the group known as "La Barca" in the Piazzo di Spagna and the Fontana del Triton in the Piazzo Barberini. Symbolical figures arranged with a great deal of vigor and executed by different sculptors distinguish the first of these.

Similar to the Fontana del Tritone are the fountains by Giacomo della Porta, the Paola in the Piazzo della Verita, and the Tartarughe. These are more sculptural than architectural and represent very graceful treatments for isolated fountains in open squares.

Many of the private palaces had in their courtyards and gardens treatments of another kind. Water was introduced in front of a wall surface and a different principle was involved. The famous Pitti Palace in Florence had, for instance, in the Boboli Gardens connected with it, many fountains, the designs of Buontalenti and Il Tribolo, who prepared the garden scheme jointly in 1549. The fountain by Ammannati, illustrated on another page, is at one end of the *piano terreno* of the palace itself, and is of the same school as Vignola's works.

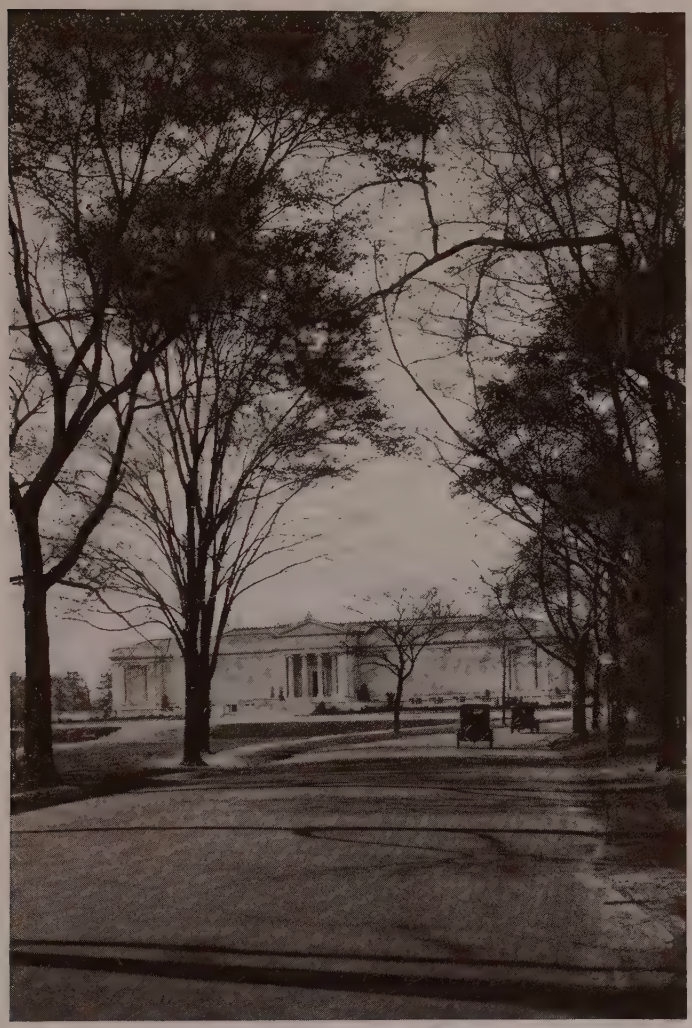
About twenty miles north of Naples is the vast royal Palace of Caserta, bearing a similar relation to its larger neighbor as Versailles does to Paris. In 1752 Luigi Vanvitelli began his grandiose scheme that developed into the elegant architectural display that is now in existence. The palace

Another view of the Cascade at Caserta, about twenty miles from Naples. Luigi Vanvitelli (1700-73) was the architect.

forms a rectangle 600 feet by 800 feet, built around four quadrangles. On the south is a colonnade containing extensive stables; on the north are the gardens and a great cascade that extend the line of the axis upward for about two miles to the peak of the adjacent hills. The palace building is far less Baroque in character than the gardens, with its cascade containing numerous white marble figures. This statuary lacks the interest of connected architectural treatment and consequently suffers a loss in artistic values. Even so, the haphazard placing of these figures in natural poses in the formal pools of running water forms a scene of magnificent grandeur that is comparable even to the effect achieved at Versailles by André.

The plans of most of the Baroque gardens and fountains of Italy are worthy of high praise, but in many cases the details are too complicated, and the ornamentation either too trivial or too cumbersome. There is oftimes a want of harmony between the landscape and the treatment of the gardens, and the fountains seem tawdry when compared to the works of the great cinque-cento architects. Too many of the details are almost puerile—as in the case of the Villa d'Este, with its toy model of an ancient city, thought to be Rome—but even the most tawdry of these treatments have a certain charm.

Fountain in the cortile of the Palazzo Vechio.



THE CLEVELAND MUSEUM OF ART

Character

THE greatness of a statue or a building does not depend on what it has in common with other statues or buildings, but on what it has peculiar to itself. "We move too much in platoons; we march by sections," said Chapin, criticizing the lack of individuality prevalent in his day.

The architect who plans a structure of character and distinction almost invariably chooses marble as the medium for his expression.

THE PORTLAND ELKS' TEMPLE

PORTLAND, Oregon, has often been called America's most beautiful city and its inhabitants are as certain it deserves this as fully as it does its other title of the "Rose City." With a population already of something over a quarter of a million, and a location that is favorable for manufacturing and farming industries, it is not to be wondered at that Portland should be rapidly taking its place as one of the most thriving municipalities of the West.

Many new business buildings have been constructed in the past few years, and quite a number of handsome homes, too, but for beauty of design and sheer elegance of interior treatment, none of these can surpass the Elks' Temple recently completed. For that matter, few club buildings anywhere in this country are superior to this fine structure, and it is easily the finest Elks' Temple in the United States.

The building stands at the corner of Eleventh and Alder Streets. Construction was begun by lifting the first spadeful of earth for the foundation at 11 P.M., December 31, 1921. Nearly a year later, September

21, 1922, the cornerstone was laid, and the work was practically completed at the end of 1923. Oregon firms provided all the equipment and materials, wherever possible, and the design and construction were the work of local talent. The architects were Houghtaling and Dugan, of Portland.

Six stories in height, the exterior style is Italian Renaissance of the earlier period. The ground and mezzanine floors, of ample ceiling height, are given over to shops, except for the main entrance on the long dimension. This entrance is impressive; it is featured by two fluted columns that divide the vestibule into three parts, each of which has its individual doorway. The side portals are arched, and above each is a circular panel in relief. Between these and over the central door there is a larger rectangular panel to conform to the shape of the central portal.

A frieze extends around the building at the mezzanine floor, with a balcony just above it. The windows of the first upper story are square headed, with heavy cornices; the next two floors have alternate arched and pedimented dormer cornices, with the top floor showing almost square windows completely surrounded by heavy mouldings, with a touch of decoration at each side. Above is a frieze course of inscriptions, above which in turn is the main cornice, heavily projecting. The building is finished off by a pseudo-attic story. The whole façade depends mainly for its effect upon the distribution and adornment of the openings, of which there are seven on the width and thirteen on the length of each of the upper floors.

Through the large doorway described above, one enters immediately into the main lobby, with its creamy coloring and its columned treatment. From this lobby, elevators and stairways lead to the rest of the building, which is devoted exclusively to the varied activities of the Elks, except for the store spaces on the ground floor. One is immediately struck by the generous proportions of the rooms, and the warmth of atmosphere that has been achieved in spite of these large dimensions. The Italian influence manifest upon the exterior is readily perceived in the interior; and the size of the

Detail of Main Entrance Doorway.

The Elevator Lobby on the main floor, with its floor of Champville marble bordered with Blue Belgian. The inserts are Black and Gold marble.

chambers is apparently less than in fact, so snug and comfortable do they seem. There is, however, considerable variation in the individual rooms, and this deviation from the usual monotony enhances the effect of each part of the structure.

The floor of the first floor lobby is of Champville marble, with borders of Blue Belgian, inserts of Black and Gold marble and a base of Tranniville. Elaborate frescoes increase the general impression of richness. From the basement two stairways lead up to the fourth floor; the treads, risers and wainscoting of the stair hall are of Colonial Gray marble from Missouri. Until one sees this material in place, one would be inclined to think that such a dark gray stone would not be in harmony with the color scheme of the rest of the building. On the contrary, it not only looks well, but has the advantage of not showing the dirt, which is bound to accumulate at intervals, even though the building is kept particularly clean at all times. Over 6,500 square feet of this marble were used, not only in the stairs just mentioned, but in the lavatories and the office room.

A long hallway on the second floor leads through a succession of high archways to the club quarters. The floor is tiled, and has a base of Tavernelle Fleuri marble. The library offers an interesting deviation from the usual Renaissance treatment. It is finished in tall walnut-brown panelling of Tennessee gumwood, and running around the upper portion of the wall is a bronze frieze that symbolizes the initiation ceremonies of the Elks. A Black and Gold

The Buffet on the second floor has counters and shelves of Blue Belge marble.

The beautiful Dining-Room, a symphony in brown and gold. Yellow Siena and Black and Gold marbles are used here.

marble base and a yellow Siena mantel add to the effect. Near at hand is the billiard room, with its bright green-topped tables contrasting with the dark wall decorations, relieved by a medly of conventionalized lions, tigers, parrots and other exotic creatures done in splashes of color.

The Card Room adopts the Chinese for its motif, and every detail has been carefully worked out. The old palaces of the mandarins are suggested by the overhanging ceiling, and the frieze shows the unsuccessful but never-ending pursuit of the Goddess of Chance, remindful of one of the dominant traits of the Oriental character.

The Buffet is across the hall, and has all the charm of the ancient wine cellar, with modern appurtenances. The counters and shelves of this important compartment are of Blue Belge marble. Check rooms and ladies' rooms are convenient to this same floor, the latter rooms appropriately done in white, with rose hangings and background accentuating slender columns of Grecian design—the whole most gracefully feminine.

The third-story lobby has floors of Italian Blue Belge, with Black and Gold and yellow Siena, the design copied from the Pompeiian. This lobby leads to the Banquet Hall, one of the most luxuriant rooms in the entire temple. The Dining-Room will seat about 135 people and the furniture is upholstered in imported mohair tapestry. The hangings are brown and gold, and a color harmony is obtained by the use of yellow Siena marble for the wainscoting and pilaster facings, with bases of Black and Gold. The ceiling is hand painted in oil and suspended from it are

several elaborate crystal chandeliers.

Across the lobby is the Ballroom, with its base of Tavernelle Fleuri to carry out the buff tone that prevails throughout the chamber—a tint that is almost the same as the exterior of the building. Prominently displayed in the frieze and ceiling are figures emblematic of the various phases of the terpsichorean art. Large crystal chandeliers afford ample illumination. The fourth floor is given over to the Lodge Room, its anterooms and the necessary quarters for the candidates and various committees. The lodge room has a wainscoting of Champville and the same material appears in the platform floor and the steps leading to it. On the two main walls are illuminated tablets in honor of the deceased members, and enumerating the principles upon which the lodge is founded. Walnut colored furnishings and light-toned hangings contrast vividly with the cream-colored pillared walls and this is intensified by a system of illumination that can be varied at will from a soft radiance to a brilliant glare.

To care for the bachelor members of the lodge, there are fifty-two suites of rooms located on the mezzanine floor between the fourth and fifth floors and on the fifth floor itself. All these are sumptuously furnished with metal that stimulates wood finish; forty-one of these suites are equipped with shower baths of Italian marble. Besides these private showers there is a swimming pool some 60 feet long, and 9 feet deep at one end.

The general equipment of the building is very complete, from kitchen to heating plant. The air of the entire building changes completely every eight minutes, the new supply undergoing washing, filtering and heating. A refrigerating system with a capacity of 500 pounds a day manufactures all the ice used. Hand-ball courts and an exercise room add to the athletic entertainment of the members.

Ballroom entrance, Elks' Temple, Portland, Oregon.

THE GENERAL MOTORS BUILDING

Its Thirty Acres of Floor Area Contain Over Four and a Half Miles of Marble Corridors

ERECTED as the result of the good will created by superior workmanship, the General Motors Building stands as a monument to the permanence and stability of the motor industry. Primarily a business structure, it possesses in its mass, proportion, silhouette and detail, all the art and beauty of a public edifice. It looms superbly on one of Detroit's principal boulevards, covering the entire city block bounded by West Grand Boulevard, Cass Avenue, Second Avenue and Milwaukee Avenue; a block 500 feet long and 325 feet deep. With its thirty acres of floor space it is one of the largest office buildings in the world, and if it were devoted entirely to office purposes, it would house 11,000 tenants. For the maintenance of the huge structure, there is required a force of 460 men and women, working incessantly.

In design and execution the building presents many interesting points. The structure is fifteen stories high, made up of the ground floor arcade, a plain shaft consisting

The entrance lobby has a marble floor in two tones of Gray Tennessee; the walls up to the ceiling are of Tavernelle.

of a series of piers and uniform windows, and an attic above the shaft formed of a colonnade of the Corinthian order, all crowned by an ample cornice.

When it was originally decided to erect the building there arose the immediate problem of securing the required amount of land in the most suitable locality. Congestion of the downtown streets and lack of proper parking facilities, particularly in an industrial city with factories widely scattered, determined the locality in an accessible and geographically central spot. Fortunately, at this location land was comparatively inexpensive and instead of high values compressing such a building into a gigantic tower with a minimum of light courts, we have an office building in its normal free development with light courts 69 feet wide; a building surrounded by wide

streets and tree-lined boulevards, providing the necessary conditions for making work both efficient and pleasant. Owing to the ingenious plan on which the building was conceived, every office is an outside room and has the advantage of unobstructed daylight.

The chief architectural interest of the building lies in the masterly handling of its separate large units, and the application of classic detail to a modern commercial structure. This building in its beauty, its cheerfulness, its unity and its repose, is but a direct and normal development of the necessity which gave it birth. Its simple, straightforward lines and the noble material out of which it was constructed, lend dignity to the structure.

It can readily be seen from the accompanying illustrations that the first floor is devoted largely to showrooms; the balance of its fifteen stories consists mostly of offices. The arcaded show windows around three sides of the first floor of the building invite attention to its ample size and to the showrooms which run straight through to the interior corridors.

A feature of the design and ornamentation is the main entrance on West Grand Boulevard. This consists of a loggia of three arches carried on warmly colored and polished columns with Ionic capitals. The vaulting of the loggia is of stone elaborately carved. The main entrance doorways in the rear of the loggia are of Tennessee marble beautifully carved from a design suggested

East-and-west corridor, ground floor, looking east.

Typical upper floor east-and-west corridor. This is a view looking west from elevator lobby, thirteenth floor.

by an old Roman doorway. These portals establish the tone of the entire building. They are amply proportioned and, at the same time, not too large. They infuse into the tenants who daily pass through them, a feeling of importance in being housed in so magnificent a structure.

Over the main entrance is a monumental clock flanked by two symbolic female figures representing Chemistry and Mechanics. The main lobby, as well as the elevator lobby, and the imposing corridors leading both east and west, have floors finished with light gray and dark gray Tennessee marble worked into a simple yet pleasing pattern. The walls are finished to ceiling height with Tavernelle marble, monotone in color, but with sufficient variety in veining and texture to give interest to the surface.

The care with which small details have been handled is shown in the character of the lighting fixtures, directory boards, store fronts and corridor doorways. The delicately modeled bronze store fronts, finished to a light statuary bronze color, are relieved by the base of Verde Antique marble. The coffered plaster ceilings of the main corridor are richly decorated in colors and old gold in the style of the Italian Rennaissance. Carved oaken doors lead from the center of the main floor elevator lobby into the ballroom and an auditorium capable of seating some 1,300 people. The auditorium

has ample corridors, foyers, gentlemen's and ladies' retiring rooms, check room, etc.

The main staircase is formed of light veined gray Tennessee marble treads and risers, with wainscoting and base of Tavernelle marble. All the corridors above the main floor have wainscoting 7 feet high of Alabama marble—a total of about 90,000 square feet. As in the case of the main floor corridor, the floors of the upper corridors are finished with light gray and dark gray Tennessee. There are, all told, about 4½ miles of marble corridors from the second to the fifteenth floors. All the toilet rooms throughout the building are finished with Alabama marble.

The upper floors, from the second to the fourteenth inclusive, are all divided into offices thoroughly lighted. No space is more than 20 feet from an outside window. On the fifteenth floor an area of 30,000 square feet is set apart for a cafeteria, dining-room, kitchen, bake-shop, etc., probably the most extensive establishment of its kind in this part of the country. Every attempt has been made to provide the most modern and efficient equipment for this cafeteria. The large, airy kitchen is fitted with various mechanical aids for the rapid preparation and serving of food. The cafeteria has a capacity of 1,250 seats. The dining-rooms are so arranged that a banquet of any size up to 1,000 guests can be expeditiously handled. In addition to the main dining-room there are four large sized private dining-rooms for public use. Verde Antique

Façade of the Laboratories Building.

marble is used as a base both for the dining-rooms and for the Board Room on the floor below.

All resources of modern knowledge relating to the construction of office buildings were brought into play in designing and creating this business home of the General Motors Corporation. It is difficult to conceive of the many complex mechanical problems which presented themselves in its design. A high type motor car involves many complicated mechanical problems; but the modern office building is, in its way, an even more complicated piece of machinery. It is designed to effect certain definite results, and to house a special group of people. The plans are more complicated than those for an automobile because they cover a much wider range of service. It requires, therefore, more imagination, ingenuity and mechanical skill to design such an elaborate and huge creation, than to plan the most powerful automobile ever built.

The four essentials in modern shelter, namely, water, light, heat and ventilation, have in this building been provided for in an efficient and permanent manner. The bodily comfort of the tenants of the building is carefully looked after. Drinking fountains on each floor throughout the building provide specially filtered, ozonated, sterilized and sparkling water. The artificial lighting is laid out on scientific principles to provide, in the different portions of the building, the proper intensity of light for the purpose to which the space is put. A well-regulated temperature is maintained throughout the building by means of 5,000 steam radiators. The windows and transoms are ample in size and number for efficient ventilation.

The building contains 24 passenger and 2 freight elevators. The passenger elevators are big and roomy, having a speed of 600 feet per minute. They are all equipped with a micro self-levelling device which automatically levels the elevators at the floors, thus combining high speed efficiency with safety. The elevators are arranged in two banks of twelve each, facing each other on opposite sides of the corridor. These elevators are placed as near as possible to the main entrance, so that they afford the quickest means of entering and leaving the building without confusion.

A large power house two blocks away from the main building provides all the necessary heat, light and power required. An underground brick lined tunnel 8 feet high and 11 feet wide is constructed between the power house and the sub-basement of the main building. Through this tunnel are laid all the service mains, including steam lines with a sufficient capacity to furnish heat to a city of 25,000 inhabitants. The power house itself is a model of efficiency. There are four enormous boilers of 500 H.P. each. In the equipment of the boiler house all possible labor-saving devices were installed. Automatic conveyors transport the coal directly from the railway cars to the overhead coal bunkers and similar conveyors carry the ashes from the basement to an overhead hopper which, by means of gravity, discharges the ashes back into the railway cars. As a result of all these improvements it requires only three men to run the entire power plant.

The main building, with space and service for 6,000 people, enough to populate a thriving village, is equipped in such a complete manner that it becomes a self-contained and independent community. Here the citizen finds all that he needs for comfort and convenience. The shops in the lobbies include a cigar store, haberdashery, drug store and soda fountain, cafeteria, flower shop, barber shop, news stand, postal

and telegraph service, public telephones, a railroad ticket office and a branch bank. Even a branch of the stock exchange is found in the building. In other parts of the building are to be found a swimming pool of the regulation size, bowling and billiard parlors containing nineteen bowling alleys and twenty billiard tables, a miniature golf course, hard tennis courts and a gymnasium. Luxurious living quarters are provided for the various out-of-town officers of the General Motors Corp.

The Laboratories Building, in the rear of the main building and running the full length of the parent structure, has a special exterior treatment. Between the windows of the second, third and fourth stories are panels of Levanto marble from Italy, as shown by the illustration on page 27.

Besides housing the general executive offices of the Corporation, the General Motors Building contains many important organizations connected with the parent company. We here find located the general executive offices of the Fisher Body Corp., the largest builders of automobile bodies in the world; and the offices of the Chevrolet Motor Co., the world's largest maker of standard automobiles. United Motors Service, Inc., another subsidiary of General Motors, is a tenant of three bays on the eleventh floor.

In different parts of the building are display rooms for the products of all the subsidiary corporations. Such well-known makes as the Oakland, the Chevrolet, the Buick, the Cadillac and the Olds are represented by first floor show spaces. GMC trucks and Dayton Wright aeroplanes are also shown. Other parts of the main floor are devoted to the display of products of subsidiary companies like Frigidaire refrigerators, the ignition equipment made by the Dayton Engineering Laboratories Co., and the farm lighting and power plants of the Delco Light Company.

The General Motors Corporation were fortunate in the selection of their architect, Albert Kahn, of Detroit, who has had so extensive an experience in industrial and commercial architecture. In the design of this structure his work speaks for itself showing, as it does, a comprehensive understanding of the practical as well as architectural requirements of an office building.

WE ARE NOW READY TO SEND YOU YOUR COPY OF BOUND VOLUME NO. 2!

(See page 69 of this issue)

The second bound volume of THROVGH THE AGES is now off the press. The full text contents of the twelve issues of this magazine from May 1924 to April 1925, inclusive, have been gathered under one cover, elaborately bound in *de luxe* form.

No architect can afford to be without this collection of authentic facts about the use of that finest of building material—MARBLE.

The edition is limited. For your convenience we are attaching an order blank on page 69 of this issue.

SEND IT IN BEFORE IT IS TOO LATE

A HANDBOOK OF MARBLE

It is the purpose of the National Association of Marble Dealers, to publish as soon as possible, a handbook on marble. The material contained in this book will be contributed by those best qualified to speak in an authoritative manner on the various matters treated. This is the twelfth installment and contains part of the fourth chapter, written by John Stephen Sewell, President of the Alabama Marble Company. These extracts will probably undergo some slight changes before appearing later in book form.

CHAPTER IV--Finishing Marble

It is convenient to divide this subject into two sections:

(1) Thin Stock—2 inches or less in thickness.
(2) Cubic Stock—more than 2 inches thick.

The first classification includes most of the so-called "plain work," *i.e.*, pieces or slabs which are nearly always rectangular and hone-finished or polished on one or more faces and sometimes on one or more edges.

The second classification includes most of the work which is cut, molded, carved, or turned and then usually hone-finished or polished.

Some light moldings are made of stock less than 2 inches thick, and some pieces of thin stock require a certain amount of cutting; on the other hand, some pieces which are more than 2 inches thick do not differ in any other respect from ordinary plain work. So the two classifications overlap somewhat; but, in the main, they are quite distinct, as will appear.

THIN STOCK

Standard thicknesses of thin stock are ⅞ inch, 1 inch, 1⅛ inches, 1¼ inches, 1½ inches, 1¾ inches and 2 inches. By far the greater portion of the plain wainscoting used in the interior of buildings is made from slabs which are ⅞-inch thick as they came form the saws. The finishing processes diminish this thickness by an amount which varies from $\frac{1}{16}$ inch to ⅛ inch—the former being more nearly an average value for the diminution in thickness.

Marble partitions, standing alone, as in toilet rooms, are made of slabs which are from 1 inch to 1½ inches thick as they come from the saws. Counter tops, table tops, seats, floor slabs, stair treads and platforms are made of slabs from 1 inch up in thickness, depending upon circumstances. Slabs 1 inch thick and thicker are also used for door and window trim, stiles and rails in panelled wainscoting, for light moldings, pilasters, etc.

Probably the principal reason for drawing the line between thin stock and cubic stock at the 2-inch thickness is that, before the diamond saw and carborundum wheel were available, stock up to 2 inches in thickness was cut or "coped" to size by hand, while if it was thicker than 2 inches, it was sawed a second, and sometimes a third time, in the gangs. There is still a good reason for continuing the practice based on the cost of sawing. It costs appreciably more to saw a block into thin slabs than into thick ones; the determining factor is, of course, the number of blades in the gang. While the law that connects the number of cuts with the rate of sawing is not accurately known, experience indicates very clearly that the direct cost of sawing thin stock, is, in general, about 20 per cent greater than the cost of one sawing for cubic stock, and that, in es-

A carborundum coping machine used for cutting slabs to exact size. This machine is also known as a gang-coper, because extra wheels can be inserted and many strips cut at once.

timating costs, to make the change at the 2-inch thickness fits the facts accurately.

COPING TO SIZE

"Coping" is the term used in the marble trade to describe the process of securing pieces of the desired size from "full size" slabs of thin stock as it comes from the saws. Formerly, it was done by laying out the sizes required on the full size slab, scoring the lines with a chisel, then breaking the marble along the scored lines. Of course, this resulted in more or less ragged edges, which were, and are, subsequently trued up on the rubbing bed, or otherwise. From ½ inch to ¾ inch has to be allowed for this, depending upon the nature of the marble, in each case. Some marbles can be broken to almost a perfect straight line—others are quite erratic.

In the case of marbles like Tennessee and the ordinary grades of white Italian where there is no question of matching or otherwise specially considering the distribution of veining and clouding, and where the blocks are of advantageous size, the waste in coping is a minimum; it may be as little as 10 per cent. In extreme cases, where the "color," as the veining and clouding are known, occurs in a large scale pattern, the waste may be 50 per cent or more.

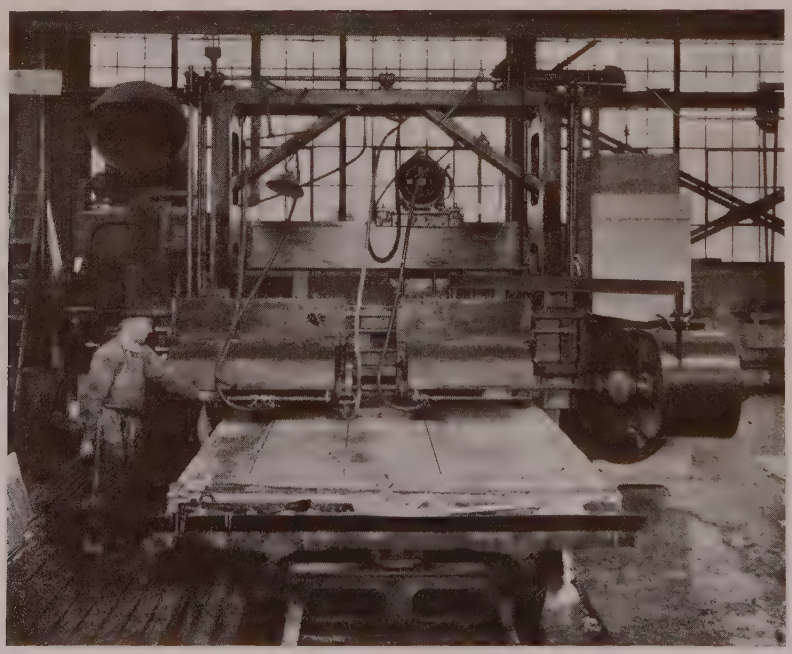
Since the introduction of carborundum, it is possible to put a slab on a carborundum machine and cut it accurately to size, with edges finished, and with a cut not more than ¼ inch wide. From one to six or more

wheels can be used at one time on some machines, and where the marble can be simply cut to size like sheets of metal, a great saving can be effected by finishing the full size slabs, then cutting them to the sizes desired on a carborundum machine. But where the color must be matched or otherwise considered, and where slabs have cracks running irregularly, but far enough apart to yield sound pieces of the desired size, it is still often more economical to cope by hand, in the old-fashioned way. In such cases, all the cuts may be oblique to the edges of the slab, and some of them may be oblique to each other. Changing the slab for cuts of varying directions on the carborundum machine may cost so much as to more than counterbalance the savings in other ways.

It costs from $2.50 to $3.50 per hour to operate a carborundum machine; it is, therefore, important to keep it cutting all the time. Idle time while running is very expensive. A hand coper's time is worth perhaps $1.00 per hour, counting his wages and the cost of maintaining a place for him to work. He can change the directions of his cuts with almost no loss of time. So the carborundum machine has, by no means, eliminated him from the trade.

The operation of coping is extremely important; if skillfully done, the waste is reduced to a minimum consistent with the best results. Of course, it is relatively simple in the case of marbles like Tennessee and ordinary white Italian. But where veining and clouding occur in any but a very small scale pattern, the use of the material to attain the best results is a real art.

If veins or clouds of color run through the block at a sharp oblique angle with the saw cuts—a condition which is often inevitable—the pattern will be offset from slab to slab, owing to the removal of the marble in the saw cut. The coper then has to shift the slabs accordingly to match the pattern. This leads to cutting off a strip from one end of one slab and from the opposite end of the other, to reduce two adjacent slabs to the



A combination coper, having a cross-cut head.

same size, with the color pattern matched. Such strips are often a total waste.

Where more has to be cut from each slab than is required by the above condition, the coper may do much to make the best possible job, by using those parts of the slabs which make the most beautiful pattern. The coper's task may be greatly facilitated, especially in the case of expensive and richly decorative marbles, if the block is sawed, to begin with, for certain pieces, considering in this connection their relative positions in the building and the distribution of color in the block. Tilting the block slightly in the gang and sawing it in a direction slightly oblique to its own principal dimensions may help the coper very materially; where thin stock and heavy pieces are in close juxtaposition in the final job, it is often necessary to saw a block in a very expensive and complicated fashion, in order to get adjacent pieces in the job out of the same part of the original block. Unless this is done, violent contrasts are often unavoidable. The best use of richly decorative marbles is really almost one of the fine arts—and the necessary skill comes only from long experience.

In all such cases, the job is made or marred, to begin with, in the sawing and coping. Subsequent processes can maintain a high standard already attained in sawing and coping—or they can greatly lower it. But no matter how well they may be carried out, they cannot make up for lack of skill in so sawing and coping the material as to bring out its greatest possibilities.

Some marbles—especially white marbles—are characterized by clouding which is not regularly distributed, nor of uniform amount and depth of color. In such cases, the coper should select neighboring pieces, first, with a view to a uniform background; this often requires using slabs from different blocks; second, with a view to having the clouding in any one group of adjacent slabs or pieces present the appearance that would have resulted if the group of pieces had all been one piece to begin with, and had been simply cut up into smaller sizes for convenience in handling or to conform to a scheme of jointing. When an architect who has been used to matched slabs is first confronted with marbles now under discussion, the irregular distribution of the color is often the first thing that strikes him, and he usually objects to it. But if the work is well done in the manner just described, the uniformity of the background soon asserts itself and becomes the dominant characteristic; in such cases, the material makes its own way into favor. It is perhaps a good thing that the nature of the marbles available compels us to use sometimes the one scheme, sometimes the other. Both are good—both have their spheres of usefulness—and each really gains in value from the existence of the other.

The next operation after coping to size, is rubbing. This is done on rubbing beds, consisting of large circular cast-iron plates revolving about a vertical axis. A thin stream of sand and water is fed onto the bed at the center and distributes itself by centrifugal force over the face of the plate. Pieces of marble to be rubbed are laid, face down, on the bed, and the face is ground smooth and true by the sand. Of course, the cast-iron plate wears away also. A plate 4½ inches thick will last about 9,000 hours. At present prices, this item represents a cost of about ten cents per hour.

If slabs have been coped by hand, the edges must be rubbed also. Usually, it is possible to have one slab edging and one facing at the same time. There must be across the bed one or more "head blocks"—usually heavy timbers—under which the bed revolves. As these have to clear the vertical axis, on one side or the other, the bed is

A rubbing bed, fitted with one principal head-block (seen just behind the vertical shaft) and one subordinate head-block, seen in foreground. On the right is a slab of waste marble, braced against the head-block, to equalize wear on the plate. On the left, just to the right of the slab being edged, is a piece of casting, used for the same purpose.

divided into two unequal parts when one head block is used, which is the usual case. When one block is used, two men can work on the same bed at the same time, but one of them can handle larger pieces than the other, as he has a greater area of the bed available.

The function of the head block is to enable the work to be held in one position while the plate revolves under it. Where a large number of small pieces are to be handled, more than one head block may be used, dividing the bed into three or four sections, and enabling more than two men to work at once.

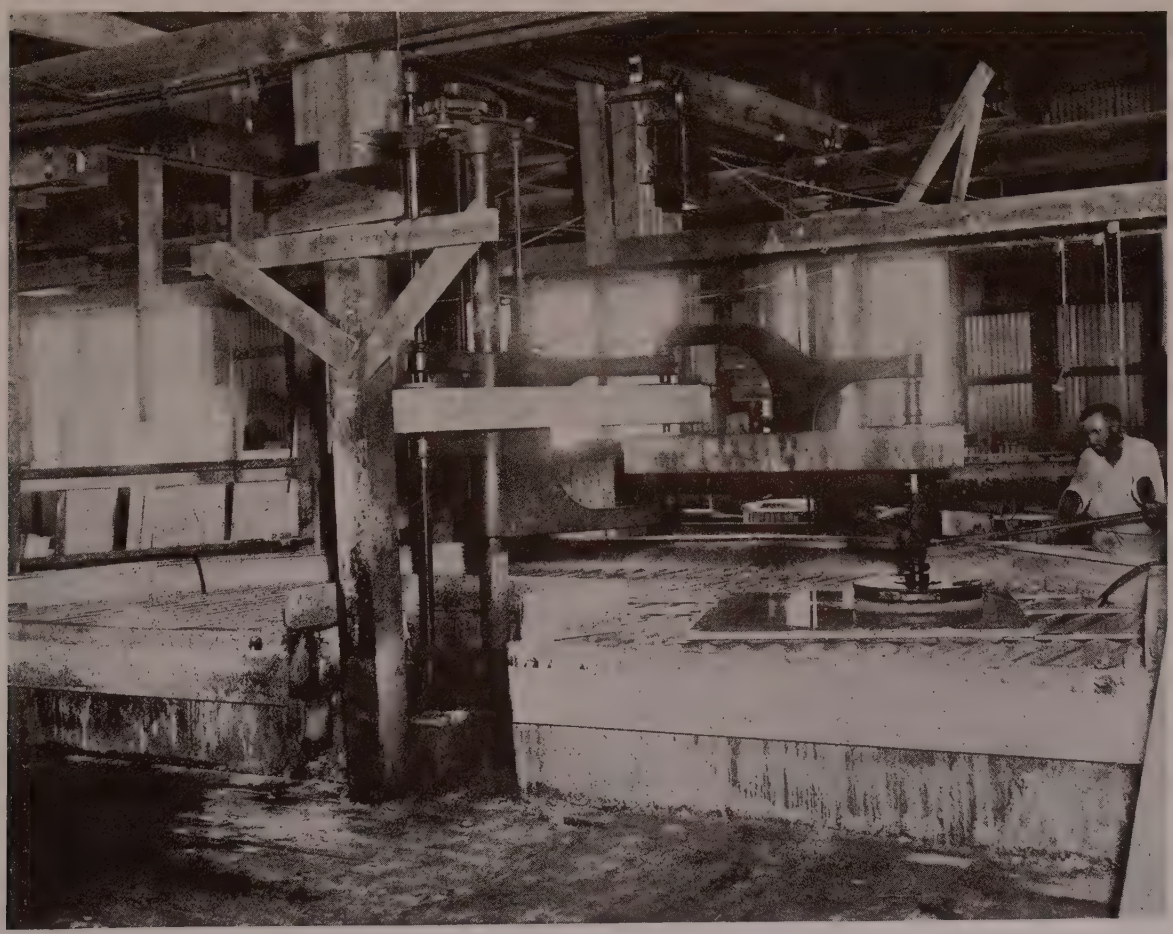
Rubbing bed plates are usually 12 or 14 feet in diameter. In large plants, it is well to have some of each size. Beds as small as 10 feet in diameter are used, but the other sizes are more generally useful.

Where a large number of narrow strips or small pieces are required, it has become customary to finish full size slabs and then cope them on a carborundum machine. This, within certain limits, is a great gain—not so much because of the reduction in direct cost, but because of the greater output from a given equipment, thus reducing indirect and overhead and increasing the rate of turnover of the invested capital, which, at the best, is rather slow in the interior marble business. If all these small pieces are first coped and then finished, one side of the rubbing beds is usually occupied with them; the other custom enables the beds to be filled on both sides with pieces as large as they will take. The output is thus considerably increased. Of course, many small

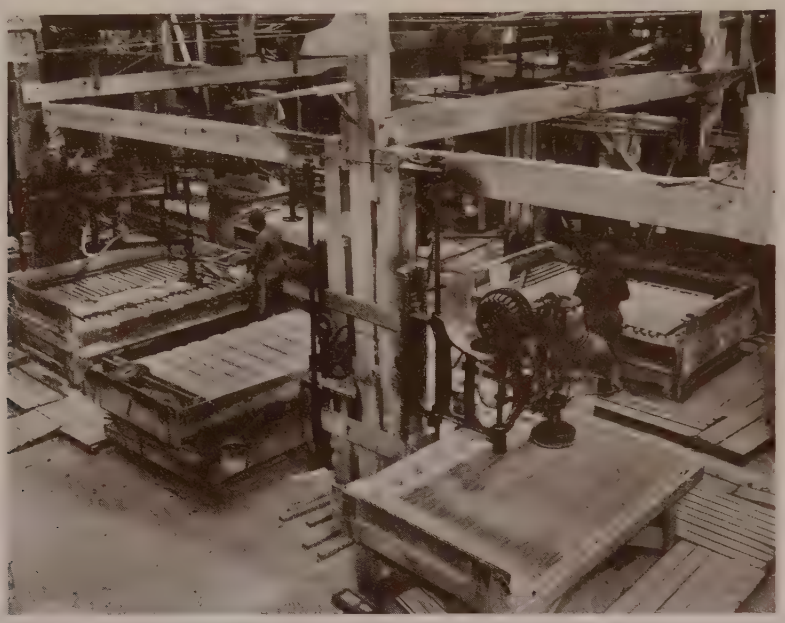
pieces must be handled in the old way, in spite of all that can be done—as when a lot of base or border is obtained from strips cut from larger slabs in previous work, or when such strips—or tiles—are obtained from cracked or unsound slabs which, because of the cracks, cannot be handled as a whole.

The rubbing bed, like the gang, looks like a rather crude tool; but a good "bed-rubber," as the workman is called, can easily work to a tolerance of one sixty-fourth of an inch—and probably to one-hundredth, if there were any need for it. He can square up pieces of marble so that they test perfectly with a steel square—and he can rub them with equal accuracy to any oblique angle, if he is furnished with a proper template.

It is necessary to keep the beds true; with pieces of varying sizes and shapes, which will naturally be kept on the part of the bed where they are most convenient to handle, the upper surfaces of the plates would soon be worn unevenly, if the matter were not constantly attended to. Pieces of scrap marble and rectangular blocks of cast iron are kept on the beds in positions where they will not interfere with the work, and so adjusted that they tend to equalize the wear. Of course, a good workman will so manage his work as to make the wear as uniform as possible; if he is a thoroughly skilled mechanic, his work will not often have to be interrupted in order to true up the bed. But with inexperienced workmen, this is a fruit-



A large gritting machine, used for buffing only.



A battery of buffing and polishing machines.

ful source of delay and expense.

Rubbing beds make a very disagreeable rumbling noise unless they are driven by gears with wooden teeth; with wooden gear teeth, if the beds are properly lined up, the beds are almost noiseless, except for the grinding of the work. They should produce no vibration at all. The best drive is an induction motor which ought to be mounted overhead at the same general level as the driving gears at the top of the shaft of the bed. A 12-foot or 14-foot bed may require nearly 25 horsepower to run it under some conditions of loading; the power required at starting may, for a few seconds, reach 35 horsepower. It is not a bad plan to drive two beds with one 50-horsepower motor, and, in starting up, bring one up to speed, empty, before starting the other. Both should be brought up to speed before any work is put on them. The proper speed is from 38 to 45 revolutions per minute.

It has been decided to incorporate in this series of articles, and in the handbook which will be the final result, a separate chapter on the subject of costs; mere statements of average costs for the various operations in finishing marble are misleading unless accompanied with detailed explanations, therefore this subject will be deferred to a proper time and place.

In the case of rubbing beds, as indeed of all marble working machinery, adequate provision must be made to carry off and get rid of the slush. Quite an elaborate system of underflow drainage is necessary; the fall must be rapid enough to keep the solid material moving, and it is well to have the drains large enough for a man to crawl through them so that in case of stoppage, they can be certainly and completely opened up without tearing up the floor. In one shop, 24-inch terra-cotta pipe was used, with a rapid fall. Of course, its capacity as a drain is greatly in excess of any actual requirements; but it has been a good investment, nevertheless, because of the ease with which it is kept clean. It carries the drainage from all the machines in one of the half-dozen largest shops in the country devoted to inte-

rior marble work exclusively, and as mere insurance against interruptions, it is worth more than its relatively small excess of cost over any other system that would work.

GRITTING AND BUFFING

These are the final operations in finishing interior marble, and, in the case of plain work, they follow immediately after the rubbing.

A gritting machine consists of a vertical shaft, belt or gear driven at the top, carrying a revolving head at the end of a horizontal jointed arm which is of such a length that it can cover the whole of any slab of ordinary dimensions. The slab is laid, face up, on top of a bench—or "banker," as it is called in the marble trade—which has a number of parallel strips of wood close together—*i.e.*, two or three inches apart—upon which the slab rests.

The revolving head is fitted with plates of gritting materials; it is brought into contact with the work and moved so as to cover, in succession, all parts of the surface to be finished. A stream of water is fed onto the work under the head, to avoid "burning" the marble. The gritting materials formerly used were natural sandstones of varying texture, from coarse to fine, followed by the application of a head fitted with pieces of hone. Some shops still use some of these natural grits, but most of them use heads made of artificial abrasives of suitable fineness made up into the proper shape by some sort of bond. Some shops make up their own gritting heads—others buy the abrasives already made up into proper shape.

The object of gritting is to reduce the surface of the marble to a finer texture than is possible on the rubbing bed. The last part of the gritting process—the "honing"—leaves the marble as smooth to the touch as if it were polished, and there is usually a dull gloss on it. When marble is to be "hone finished," this is the last finishing operation; in that case, the honing is carried to the limit, and somewhat farther than is necessary, if the marble is to be buffed or polished. It follows from this that there is no material difference in cost between hone-finished marble and polished marble.

The buffing or polishing is done on a gritting machine, fitted, for this purpose, with a revolving felt head. The stream of water is cut off, the polishing material is scattered on the face of the work, with enough water to keep the slab wet, but not enough to run off and carry away the polishing material.

The polishing material most commonly used is "putty powder," the essential ingredient of which is dioxide of tin (stannic oxide, SnO_2); it has the same chemical composition as cassiterite, the only important ore of tin, but, for use in the arts, it is artificially prepared. It is a rather interesting substance, because of its resistance to acids, and its great hardness, nearly equal to that of quartz. It is never used by itself in polishing marble, but is usually mixed with some other powder (usually oxide of lead), as a carrier; the operation of buffing is usually facilitated by using a little oxalic acid along with the putty powder. The action of the acid seems to be to render the superficial crystals slightly pasty, so that they readily spread out and fill up any microscopic spaces between adjacent crystals, and also yield more readily to the polishing action of the putty powder. It used to be customary to specify that marble should be polished with putty powder alone, in the best work—the idea being that the polish would be more lasting. But if the slab or other piece of work is thoroughly cleansed after polishing, there is reason to believe not only that the polish is just as permanent when a little oxalic acid is used, but also that the polished surface is impervious to the highest degree.

A LIST OF THE WORLD'S MARBLES

By J. J. McCLYMONT

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

GROUP A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

GROUP B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

GROUP C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

GROUP D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

Limestone

"The name limestone as commonly used is made to include a large and widely varying group of rocks, differing from one another in color, texture, structure, and origin, with but one property in common of consisting essentially of carbonate of lime. A pure limestone should consist only of carbonate of lime. In point of fact, however, none of our natural stones are chemically pure, but all contain a greater or less amount of foreign material either chemically combined or as admixed minerals." (George P. Merrill—Stone for Building and Decoration.) Most limestones were formed by the deposition of sediment on the bed of the sea, consisting of vegetable matter, gravel, sand, mud, shells, and remains of animals.

Limestone River

Quarried in Omeo Township, Benambra County, Victoria, Australia.

Brilliantly red mottled ground mass, in which are patches of white calcite.

Takes good polish. (Watson.)

Limonite

This is a hydrous oxide of iron, a hydrated hematite, which when scratched or powdered gives a brownish-rust color.

L'Improneta

Quarried at L'Improneta, near Florence, Italy.

Variegated clear green olive green and brown. (Blagrove.)

Lindewiese (Schwarz)

Nieder Lindewiese Quarries, Silesia, Austria.

Very dark gray (almost black) with occasional small light gray patches. (Watson.)

Takes medium polish.

Linghon

Quarried near Ambleteuse, Pas-de-Calais, France.

Gray with red veins. (Blagrove.)

Liniato di Arno

See Giallo Liniato di Arno.

Liniato di Arno
Quarried near the banks of the Arno, Italy.
Olive tint marked with lines of darker shade and reddish brown spots. (Blagrove.)

Liniato di Pratolino
Quarried near Pratolino Tuscany, Italy.
Grayish-green with bands and veins. (Blagrove.)

Lion Rock—See Cornish Serpentine from Good Castol Quarries.

Lios das Lameiras
Lameiras Quarries, Pero Pinheiro, Estremadura, Portugal.
Light fawn color, containing many fossils. (Watson.)

Lisbon—See Borba Red and Borba White.

Lisbon Red—Same as Empress Red.

Liseron—See Rose Liseron.

Lissourghter or Lissoughter Hill—See Connemara from Lissoughter Quarries.

Listato
Banded or veined.

Listato Alabaster—Same as Alabastro Listato.

Listato Marble—Same as Bigio Antico Listado.

Listato Verdiccio Alabaster—Same as Alabastro Listato Verdiccio.

Listavena—Group B.
Similar to Jackman and Light Smith.
Quarried at West Rutland, Vermont.
Veins of green or olive alternating with bands of white or pinkish white.
Takes medium polish.

Listellato—See Bardiglio Listellato.

Lithostrotion
One variety of the coral fossils found in marble.

Little Beltor (Pink) or Little Beltor marble.
Quarried at Ipplepen, Devonshire, England.
Pink and gray mottled with slender red markings.

Little Beltor (Yellow)
Quarried at Ipplepen, Devonshire, England.
Mottled yellow, pink and gray with white veins of calcite. (Watson.)

Little Island—Same as Victoria Red.

Livernon
Quarried at Livernon, Lot, France.
Reddish-pink.

Livido Marble—Group B.
Vermont Marble Company's Quarries, West Rutland, Vermont.
Bluish-gray of a not very dark shade with numerous veins and spots of much darker shade.
Takes medium polish.

Lizard Promontory
On this promontory in Cornwall, England, are located the quarries that produce Cornish Serpentine.

Lizard Promontory Serpentine—See Cornish Serpentine.

Lizzie Clay and Pulp Company's Quarry—See Jersey Green.

Llanfechell Serpentine
Quarried at Llanfechell, Anglesea.
Greenish serpentine, sometimes reddish-green. (Blagrove.)

L. M. Italian
Trade-mark for No. 2 White Italian.

Loch Kilchrist
To the south and southeast of this lake in the Island of Skye, the Skye marbles are found.

Loch Leven—See Ballachulish which takes its name from the town of Ballachulish, on the south shore of Loch Leven.

Lompnes or Lompines.
Quarried in France.
Dirty buff color with rust spots.
Takes medium polish.

Lonsdaleia Duplicata
A Madreporarian coral fossil found in many marbles.

Lorrain
Quarried at St. Catherine, near Nancy, France.
Variegated white, gray, yellow, red and black.
Takes a good polish. (Blagrove.)

Loubie
Quarried at Loubie, Eastern Alps.
White with occasional gray veins. (Blagrove.)

Lough Dunlewy—See Dunlewy.

Lourdes—See Lumachelle de Lourdes, St. Florent and Vielle-Violet.

Louverne—Same as Gris Louverne.

Louvie-Juzon Quarries—See Gris Tendre de Louvie.

Louvie-Soubiron—See Bleu Fleuri de Louvie.

Lower Austrian Marbles—See Engelsberger and Marbacher.

Lower California Onyx—Same as Pedrara Onyx.

Lucullan Marble (Ancient)
According to Pliny this marble takes its name from Lepidos L. Lucullus, and was quarried on the Island of Melos (Modern Milo) in the Ægean Sea.
Other authorities claim that this is but another name for Nero Antico from Cape Matapan, southern Greece.
The color is given by Miss Porter as blackish-gray, and by Pliny as entirely black.

Lucon Marble
Quarried in Vendee, France.
Red with spots of deeper red, black and pale gray. (Blagrove.)

Lucon Marbles
Quarried at Gochenee, Namur, Belgium.
Lucon Cailloute has a background of dark gray spotted with pale gray, white and red.
Lucon Chocolate has a background of chocolate mingled with red and occasional large gray veins and spots. (Blagrove.)

Lucs (Granite)
Quarried near Lucs, Vandee, France.
Various shades of gray, blue and red, with some fossils. (Blagrove.)

Luinachella—See Encrinital.
Italian name for marbles containing encrinitals.

Lumacato—See Bigio Antico Lumacato.
This name as applied to marble means the same as Lumchella or Shell marble.

Lumacato Chiaro—See Bigio Antico Lumacato Chiaro.

Lumachella
From Lumaca (snail), generally spelled Lumachelle.

Lumachellato—See Bigio Antico Lumachellato.

Lumachellato Piccolo—See Bigio Antico Lumachellato Piccolo.

Lumachelle Antico (probably modern).
Earthy gray, with large snails. (Pullen.)

Lumachelle Bigia (Ancient)
Light brown, densely crowded with very small fragments of black and transparent grayish-white. (Pullen)
Or gray, veined with brown and full of brown shells. (Pullen.)

Lumachelle Bigia Bruna (Ancient)
Black peppered with gray and crowded with large white snails, faint flush of rose. (Pullen.)

Lumachelle Bigia di Egitto
Densely crowded gray snails with few yellowish-white, flush of pinkish-brown, or gray, with white and blue snails and a little gold, or bluish-gray with yellowish-white snails. (Pullen.)

Lumachelle Bigia Gialastra
Gray tinged with yellow. (Pullen.)

Lumachelle Bigia Orienale
Bluish-gray, with numerous white snails. (Pullen.)

Lumachelle Bigia Rossastra
Gray flushed with pink. (Pullen.)

Lumachelle Bigio (probably modern)
Large gray snails and small white shells.

Lumachelle Bruna Rossastra
Brownish gray, flushed with pink. (Pullen.)

Lumachelle Champenoise
Quarried near Rheims, Marne, France.
Yellowish-gray with numerous fossils. (Blagrove.)

Lumachelle Degli Abruzzi (Ancient)
Light buff gray, crowded with tiny shells of the same hue and larger ones of slate blue. (Pullen.)

Lumachelle de Lourdes—Group C.
Quarried near Lourdes, Hautes, Pyrenees, France.
Reddish-fawn color, crowded with fossils. (Watson.)

Lumachelle des Argonne or Pierre Chaline or Racine de Buis.
Name given to marbles quarried in the Forest of Argonne at Avocourt, Brocourt, Parois, Rampont, Rubreville and Verdun, Meuse, France.
Consists mostly of blackish and bluish-gray backgrounds. Some are tinged with yellow and reddish hues and all have a tendency to turn yellow from exposure. (Blagrove.)

Lumachelle des Bossus
Quarried at Fontenelle, Aisne, France.
Bluish-gray with white cloudy veins and whitish translucent fossils. (Blagrove.)

Lumachelle di Calabria
Quarried near Pallizzi, Calabria, Italy.
Buff, peppered brownish-gray, with bluish snails and fragments of white round shells.

Lumachelle di Egito (An ancient stone.)
Golden yellow, with snails of bright yellow and bluish-gray.

Lumachelle Gialla (Ancient)
Large yellow snails with gray chips.

Lumachelle Gialla Bigiastra Minuta (Ancient)
Close-grained light brown, with gray and yellowish snails.

Lumachelle Gialla Pavonazza (Ancient)
Dark brown, with orange shells and snails, yellow chips and circlets having brown centers.

Lumachelle Lionata (Ancient)
Reddish-brown, blotched with pink, suspicion of white and yellow. (Pullen.)

Lumachelle Marble or Lumachella or Lumachello.
Is a fossiliferous limestone in which the shells still retain their nacre, or pearly lining, and which when polished gives off in spots a brilliant iridescent lustre with rainbow tints; the finer varieties being seemingly set with opals.
It is a beautiful stone for inlaid work and elaborate ornamentation, but is usually found in small slabs. (Merrill.)

Lumachelle Minuta (Ancient)
Red with tiny fragments. (Pullen.)

Lumachelle Nera (Ancient)
Bronze, with tiny streaks of yellowish-brown. (Pullen.)

Lumachelle Nera Minuta (Ancient)
Jet black, with numerous small curly white snails. (Pullen.)

Lumachelle Pavonazzo (Ancient)
Purple peppered with tiny white fragments and a few rosy flints. (Pullen.)

Lumachelle Pavonazzo Disfatta
Very much broken. (Pullen.)

Lumachelle Persichina (Ancient)
Lilac. (Pullen.)

Lumachelle Rosea (Ancient)
Pale chalky rose and yellow, crowded with small narrow slugs. (Pullen.)

Lumachelle Rossa (Ancient)
Uniform crimson and semi-transparent white. (Pullen.)
Or red with grayish-white madrepores.

Lumachelle Violetta (Ancient)
Violet, tinged with blood red, snails, white or gray, touched with gold.

Luna Marble or Luni Marble
Ancient name for marbles from the vicinity of Carrara, Italy.
The name Carrara is said to be derived from the Latin quareria which is sometimes spelled cariera.

Lunel
Quarried in the Valley of Heureuse, near Boulogne-sur-Mer, France.
Brownish-gray monotone.
Takes medium polish.

Lunel Fleuri
Quarried in the Valley of Heureuse, near Boulogne-sur-Mer, France.
Brownish-gray with flowered markings of darker shade.
Takes medium polish.

Lunense Antico—Group A.
Fantiscritti Quarries, at Carrara, Italy.
Pure ivory white statuary, no crystals, texture soapy, inclining to that of china.

Lunense Macchiato—Group A.
Originally from the Fantiscritti Quarries, at Carrara, but now quarried in abundance at Crestola, Zampona, Bettolia and Ravaccione.
White with bluish tinge, and streaks of black or black metallic spots.

THROVGH THE AGES

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The doors at the back of the stage in the War Memorial, Baltimore.

THROVGH THE AGES

A Monthly Magazine devoted to the uses of Marble – its universal adaptability, beauty, permanency and economy.

VOL. 3 JUNE, 1925 NO. 2

THE WAR MEMORIAL

A New Monumental Structure Recently Opened in Baltimore

BALTIMORE has lately acquired a building whose external formality is as severe as its interior grace is attractive. This is the new War Memorial erected by the people of the State and the City in memory of the native sons who fought in the World War.

The structure has just been completed and was dedicated on April 5, 1925. It occupies a space on the east side of a newly razed area that formerly was the site of a jumble of business houses of a nondescript character. It faces west, upon what will eventually be a municipal square; on the opposite side of this square is the first of the three old civic buildings that dominate this portion of Baltimore—the City Hall. On successive blocks are the Post Office and the Court House, all of them built of that Baltimore County marble used so extensively in the Monumental City in the last half of the nineteenth century.

The architect of the War Memorial, Laurence Hall Fowler, was chosen after a competition that produced several schemes of real merit. His design provided for a hall large enough for concerts, mass meetings and similar gatherings, yet not so utilitarian as to blur the memorial character of the monument.

The impression gained by the passerby is that of a building carefully studied as to detail, but almost forbidding in its austerity. The ornamentation is conventional and frigid, lacking that pliancy characteristic of the Grecian art at its best period. The Doric columns of the front portico support an unusual weight of stone above, most readily observable when viewed from either side. The walls are battered slightly and at each angle are raised acroteria. These, together with a delicate cresting, tend to relieve the austerity slightly. On the north and south façades, the order is repeated in the form of pilasters, not much more than suggestions, and tied to the main portico by ornamental bands. In spite of the sternness of the lines, it is evident that much care has been expended on the design, and there is an imposing strength about it that is not to be underestimated.

The entranceway leads into a vestibule that is strikingly original, not so much in its plan as in the color scheme and the mate-

The new War Memorial Building in Baltimore stands on the east side of the new municipal square, opposite the City Hall.

rials. The floors, walls and ceiling are all of a dark red marble, spotted with white fleckings, rich in color and warm in tone. This marble, which is used in other parts of the interior, and of which mention will be made again, is Red Ark Fossil, from Arkansas.

From this vestibule are doors opening into the main hall and yet not directly onto the auditorium floor. There is a kind of lobby, a few feet below this main floor level, from which four stairways ascend, two directly ahead and two at either end. Between the former pair is a descending stair leading to the trophy room below.

The visitor is at once struck by the impression of grandeur, even before he has had a chance to take in the warmth and color of the great hall itself. A closer study will reveal the reason for such a feeling. On every side is a wealth of marble; under foot the floors are of dull Italian Travertine; the walls up to a height of some 18 feet are glistening slabs of Tavernelle; lamp standards, with bases of Tavernelle and Belgian Black marble, are conspicuous. This same combination of materials is used for the sides and tops of the stair walls, the treads themselves being of Travertine. Directly in front is a broad marble stairway leading to the trophy room below. Through partly opened bronze doors a glimpse may be had of colonnaded depths below.

Ascending any of the four stairs, the whole room may be studied at leisure. Extending around both sides, the floor is raised a height of 2 or 3 feet, separated from the central seating space by a parapet of Tavernelle marble, topped by a cap of Belgian

Black, and relieved at intervals by lamp standards similar to those described above. The eye is led naturally to the platform at the end of the room which serves as a stage.

This stage is one of the most prominent architectural features of the room, the focal point of the interior scheme. At the rear of the rostrum are curious bronze double doors that are highly suggestive of the tomb and the resurrection. A marble urn of classic beauty is placed over the center of this door. The grill above, vast in its expanse, and handsomely painted with gold ornaments, serves as a screen for the organ which one day will be placed in the space behind. The eye is held by the accumulation of effects, notable as much for their intrinsic beauty as because the architect has achieved a fine mood of mysticism which is proper in a building of this character, but so rarely found.

Overhead is an area of sheer blue, the blue of the open sky, surrounded by borders of ornamental beams painted in subdued colors. It is almost as if the chamber were open to the sun and rain, so closely does the ceiling shade approximate the dome of Heaven. High up on the walls, above the columns that encircle the whole room, are inscriptions reciting the names and dates of the

View of main hall looking west toward the entrance. Travertine, Belgian Black, Tavernelle and Red Ark Fossil marbles were used.

The west end of the Main Auditorium, showing the four flights of steps leading to the main floor level.

battles in which the Maryland troops participated. Lower down, beneath each window, are shields, each emblazoned with the insignia of one of the American Divisions of the Expeditionary Force.

The floor of the main hall is of marble terrazzo in a pattern of alternate strips of two tones of gray. The inner side of the parapet surrounding the seating space, as well as the front of the rostrum itself, is

The balcony at the rear of the hall with its columns suggestive of Egypt.
Note the divisional medallions on the walls.

wainscoted in Red Ark Fossil marble, affording a touch of color in pleasing contrast to the gray note that predominates.

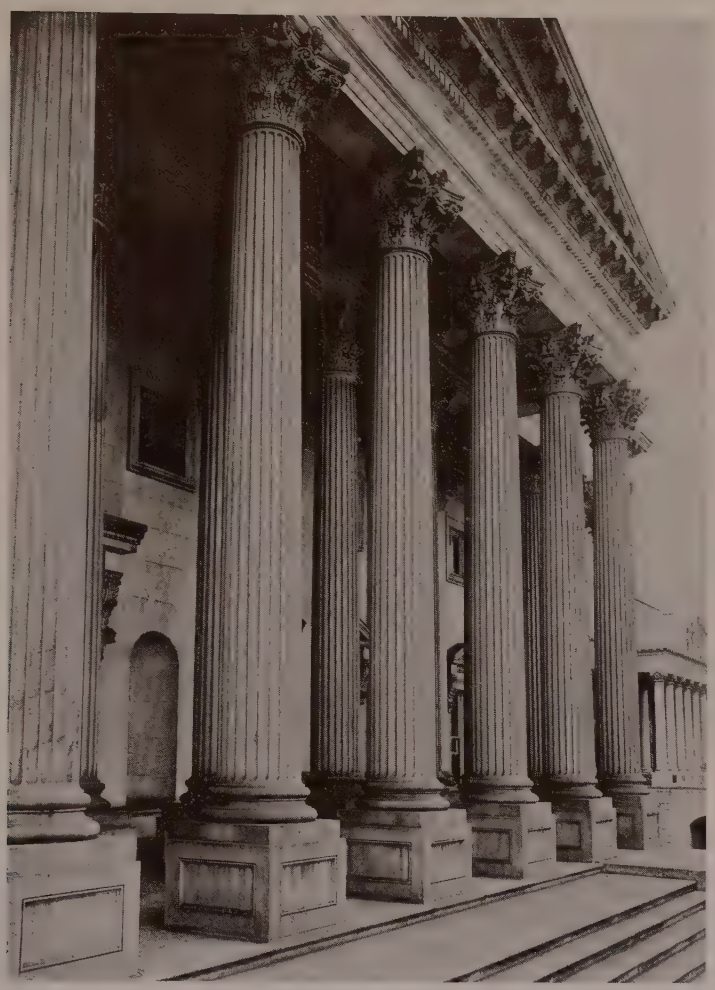
Standing on the stage, and looking toward the western end of the room, other features impress themselves. The beauty of the entrance is here felt more keenly. The black of the marble, the broad stairs, the graceful funeral urns that flank them, assume to themselves a new beauty. We note for the

first time, too, the colonnaded balcony that fills two-thirds of the rear wall space, and we perceive an unusual character in the design of the columns that is suggestive of the Nile rather than the Tiber or the Ægean Sea.

On the floor below the main hall, space is taken up chiefly by a large open room of moderate height with a beamed ceiling, and intended as a Trophy Hall. The floor of this compartment is of Napoleon Gray; the same material is also used for the adjoining chambers, which have been assigned to various patriotic societies. Around the sides of the Trophy Hall are fluted columns bearing rather odd looking capitals of Ionic motif and sheathed at the base in Red Ark Fossil marble. The room is wainscoted to a distance of 5 or 6 feet from the floor in this same red stone. Conventionalized ornamentation in color is applied to the ceiling.

It is evident that the architect has been handicapped by lack of funds. "He has been forced in many matters to use imitation material," said the Baltimore *Sun*, "when the crying need was for real. But architects have always been so handicapped. What Christopher Wren did with St. Paul's has always indicated that the competent architect may rise superior to such obstacles. This building is a proof that good taste and true love for the task in hand will inevitably produce a thing in which all of us may take a lasting pride."

The Trophy Room in the War Memorial Building, Baltimore, has a floor of Napoleon Gray, with wainscoting of Red Ark Fossil marble.



Monolithic columns of Maryland marble in the wings of the National Capitol at Washington.

MARBLES OF MARYLAND

Quarry Development Has Been Slow, Chiefly Through Lack of Capital and Disappointed Expectations

COMPARATIVELY few Marylanders know that their state has produced in the past fifty years a considerable quantity of marble. This output, though relatively small when compared to the showing of such states as Vermont, Alabama, Georgia and Tennessee, nevertheless was a factor at one time in construction work all over the eastern part of the country. Today, however, Maryland marbles are not being quarried with any degree of regularity for building work, though they are being used to some extent for other purposes.

The State House at Annapolis was built of Maryland marble; so was the Washington Monument in Baltimore. So, also, were the Peabody Institute, the Courthouse, the Savings Bank of Baltimore, Enoch Pratt Li-

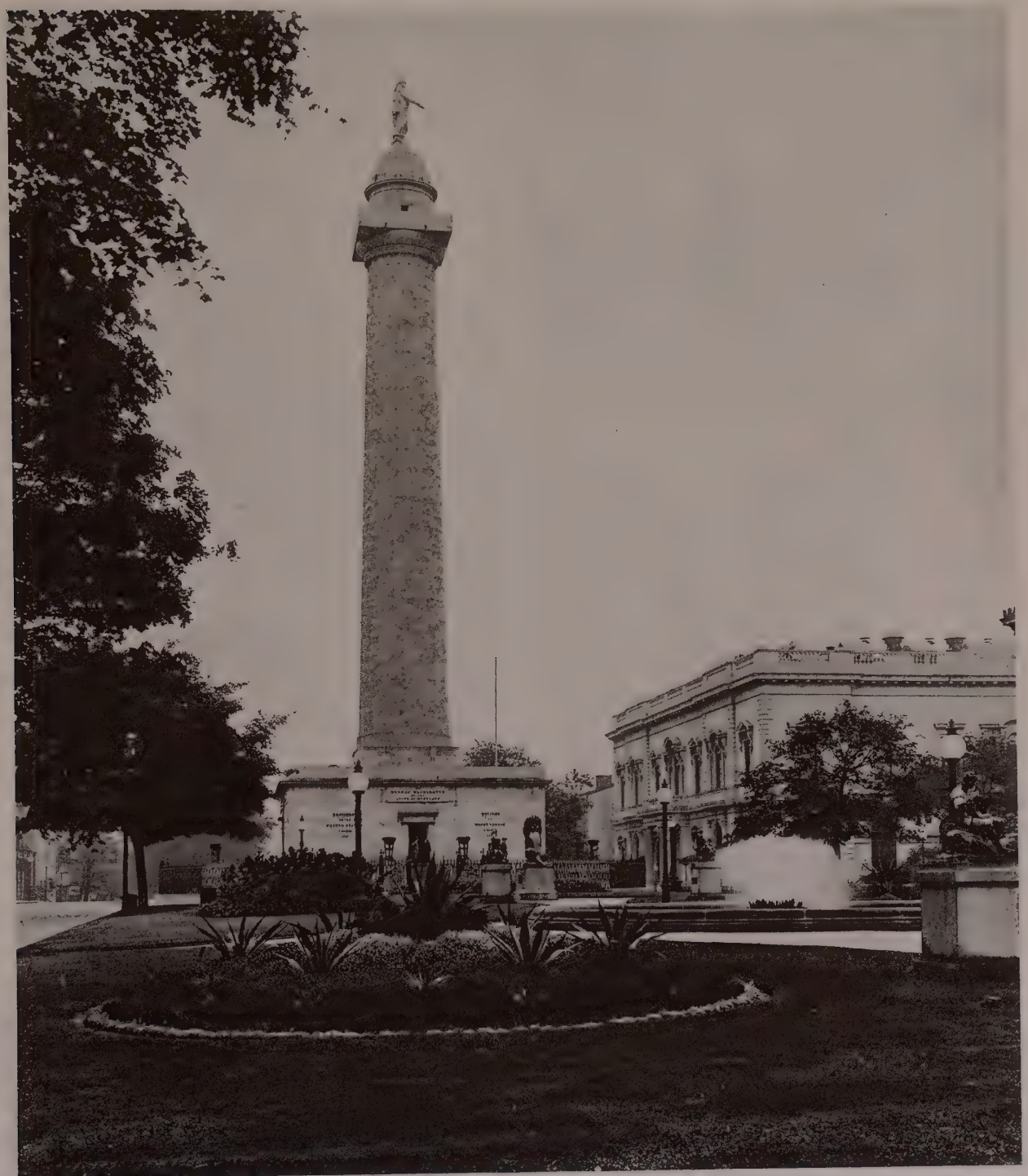
The First National Bank, New Windsor, Maryland; A. C. Leach, architect. Both exterior and interior are of Mar Villa marble.

brary, the old Citizens National Bank, the Oheb Shalom Temple and the First Christian Science Church, all in Baltimore. Away up in Buffalo stands the Albright Gallery of Art, one of the most imposing edifices of its kind in the country—a solid structure of brilliant white marble taken from the soil of Maryland not fifteen miles from Baltimore. In Philadelphia similar material built the Drexel Bank and the Penn Mutual Building; in New York it was used for the spires of St. Patrick's Cathedral and for the Metropolitan Club.

One of the most famous piles of masonry in the country—the Washington Monument in the National Capital—was constructed chiefly of marble from Cockeysville and Texas, Baltimore County, Maryland. Further examples are to be found in Washington in the extension of the Patent Office Building, the old General Post Office and in the main hall, stairway and colonnade of the Senate Office Building. The wings of the Capitol Building contain 108 fluted monoliths each 26 feet long of Cockeysville marble, placed there during the administration of Thomas V. Walter as architect of the building. Mr. Walter, it is interesting to note, was a pioneer and active promoter of the American Institute of Architects.

To the layman, statistics usually mean little. Even a visit to a quarry, with its exposed fields of white stone, has but scant significance. He sees a great stretch of white, with streaks of pink and splashes of dull brown and green where, on the ledges left by the cutting process, dirt has fallen and vegetation has developed. He sees men working with hand and steam drills, the mechanical channelers cutting long lines in blocks of seemingly inexhaustible deposits, huge derricks lifting out the blocks after they are broken out, men with tools cracking off defective pieces to be sold as rough-back for minor construction—and he asks why more capital doesn't go seriously into the development of all the state's resources.

The Towson National Bank, Towson, Maryland, is built of a pink-tinted marble.



The first monument to Washington was erected in Baltimore of Maryland marble. The statue at the top is 16 feet, wrought in three separate pieces, from one block of 36 tons, by Henrico Cancici, an Italian sculptor of merit. It was elevated by means of a pair of shears attached to the cap of the column by pulleys and capstan, planned and directed by Capt. James Woodside, of Washington.

The Second National Bank of Towson, Maryland. This marble also came from the Cockeysville district.

As a matter of fact, any man who goes into marble quarrying, whether in Maryland or in Colorado or anywhere, undertakes a big job. The earth's movements have cracked the stone until what looks on the surface like a good deposit, might turn out to be a dead loss, after the expense of stripping away the dirt and drilling. Cutting marble is a costly and tedious process and the profit is comparatively slight.

There are many old quarries scattered around Maryland. At Cambria and Cardiff there are Verde Antiques, classified as a trade marble, but scientifically not marble at all. At Boonesboro and Eakles Mills are small deposits of cream colored marbles. At Benevolla there are both marble and limestone deposits, practically unworked. Some little marble has been taken from time to time from quarries at Gunpowder Dam and Whitehall. At the latter place the material was Verde Antique, and showed both good color and quality. The entire hill was destroyed by dynamite in getting out crushed stone for road building. This dynamite, exploded at the bottom of 20-foot holes, opened up such seams that it was impossible afterwards to take out blocks larger than 2 feet in length—a glaring example of man's greedy short-sightedness. Today, the quarry is furnishing ballast for the Northern Central Railroad. The bulk of the real quarrying in Maryland has been done, however, at Cockeysville and Texas, a few miles north of Baltimore, on the old York pike.

In a history of the character and distribution of marble in Maryland, written by Dr. Edward B. Matthews, we read the following: "The rock of Texas," he writes, "is a coarse grained marble of nearly pure carbonate of lime, suitable for use as flux or fertilizer, while that at Cockeysville is a finer grained, dolomitic marble rich in magnesium and well adapted to building and decorative purposes. Dr. H. H. Hayden, who was a dentist and whose descendants are leading business men of today, first became interested in geology as a sort of hobby and wrote a letter way back in the 1700's, pointing out the possibilities of this marble to Dr. Nathaniel Potter. His judgment was justified when the marble was used to make the statue of Washington that surmounts the monument in Baltimore." This statue is famous as the first erected in

The Maryland Club, Baltimore's most exclusive social organization for men, was built of Maryland marble.

America to our most famous countryman. In the fifteen years that followed very little marble was taken out beyond some 200,000 bushels a year that went into fertilizer, being burned, crushed and scattered over the farms. The authorities, fearing the depletion of the supply by even such modest withdrawals, made arrangements to have a geologist explore the region. He reported practically inexhaustible stores of this material.

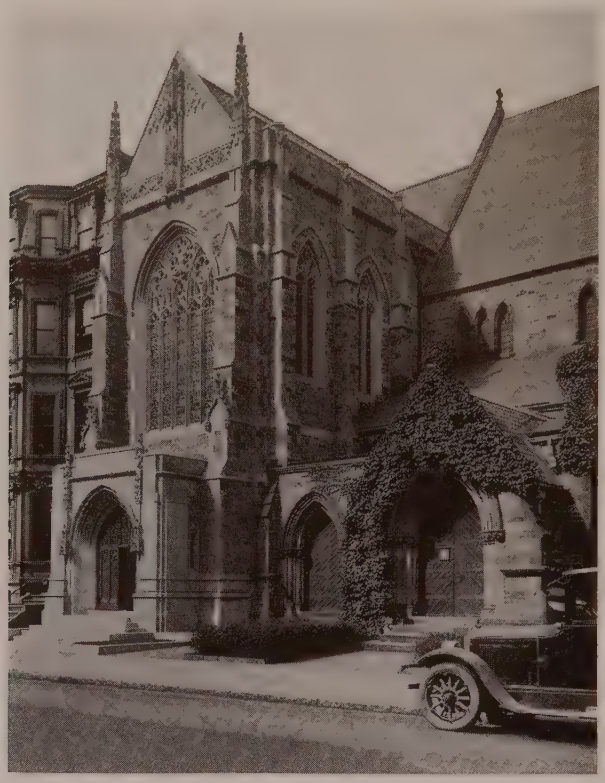
In 1847, Dr. David D. Owen, of the Smithsonian Institution, reported thirteen quarries in active operation in the Cockeysville-Texas field.

In 1913, Dr. Matthews wrote as follows: "The Cockeysville marble is of splendid quality. The grain is fine, seldom exceeding one-sixteenth of an inch in diameter. Its crushing strength is 22,416 pounds to the square inch, and the absorption ratio is low —0.213 per cent. In color it is pure white with now and then a few streaks of pale blue, which gives the rock a faint gray appearance."

The stone takes a good finish, becoming almost dazzling white, as seen in the marble steps of thousands of houses in Baltimore, as famous throughout the country as the oysters and crabs of the Chesapeake Bay. All the marble is not white, however. In the large monolithic columns of the Hearst Tower, formerly the Maryland Casualty Building, and in the interior work of the Western National Bank of Baltimore and the Towson National Bank, Towson, Maryland, there was used a variety of stone with a pinkish tint, not unlike that of some of the Tennessee marbles, with irregular lines and shades that are distinctively artistic.

In 1896–98 Maryland quarries, chiefly at Cockeysville and Eakles Mills, produced from $110,000 to $130,000 worth of marble each year. These figures dropped from 20 to 40 per cent in the next seven years, when the rebuilding operations after the Baltimore fire of 1904 brought the demand in 1905 and 1906 up to $138,404 and $176,495 respectively. In 1913 a number of Baltimoreans stepped in and organized the largest company in the state to work the quarries near Cockeysville. The output ran to about $100,000 a year, which was inconsiderable when compared to the $3,493,000 worth produced by Vermont in 1909. Since then there have been one or two attempts to work the quarries, with varying success, but the production figures have never been of a nature to place Maryland prominently among the states considered as centers of the marble industry.

The Court House in Baltimore is a fine old structure in the Renaissance style. The exterior is of Cockeysville marble



THE LESLIE LINDSEY MEMORIAL

The New Chapel of Emmanuel Church, Boston

TEN years ago there occurred one of the great tragedies of the Great War. On May 7, 1915, the civilized world was startled into horror by the news of the sinking of the *Lusitania* and the death of hundreds of innocent passengers aboard that ill-fated vessel. Among these passengers were Leslie Lindsey Mason and her husband, Stuart Southam Mason, the former the daughter of William and Anne Hawthorne Lindsey, of Boston.

Last year there was consecrated in the old New England city a new building that had been erected in loving remembrance of their daughter's untimely end—the Leslie Lindsey Memorial, the new chapel of Emmanuel Church. The architects of this structure, Allen and Collins, of Boston, combined in their plans features from the best examples of the various periods of English Gothic.

In general form and proportions the precedent of the English Perpendicular was followed; the lower arcading of the nave is decidedly Early English; the window tracery is reminiscent of the Decorated Period.

This mixture of styles was intentional. Indeed, the charm of many of the ecclesiastical buildings in England is due to this lack of adherence to a fixed type; construction then extended over a considerable period, and new influences almost invariably developed between the laying of the foundation and the final finishing touches. Eccentricities of treatment in the Lindsey Memorial were necessitated, moreover, by certain conditions of the site; the narrow lot and the blank walls of the adjoining

buildings introduced difficulties of design the solution of which have proved far from detrimental to the whole scheme.

The exterior is built of the same stone as the parent church, a Roxbury conglomerate with limestone trim and tracery. Beneath the great nave window a low vaulted entrance porch leads into the nave itself, a vault that rises to a height of 46 feet and extends to the north with seven equal bays a distance of 85 feet. The last bay forms the chancel, with a deep traceried sanctuary arch. The side walls are pierced with windows only in two places, but this absence of fenestration is offset by an applied arcade with a rich carved cresting and panels of warm Bath Stone, the lofty slender columns and rich fan tracery and carved bosses of the groined ceiling.

The floor of the nave is of Travertine marble, which affords a happy contrast to the Botticino marble of the chancel, floor and steps, and the Bath Stone chancel rail and the Caen Stone pulpit base. The pulpit, choir stalls and lectern are of oak, richly carved, the lacework panels of the canopies rising in crocketed finials against the warm background of the Bath Stone walls.

The nave, looking toward the reredos.

Details of the reredos, showing the thirty-six small alabaster statues in the niches.

One of the interesting features of the chapel is the symbolism that has been employed throughout the carving in wood and stone. Bosses, pendants, saints and angels all contribute to this human interest. Birds, animals, flowers, various objects and even colors have their ecclesiastical interpretation, so that the chapel reveals a story to the observant from the entrance door to the bosses of the ceiling.

The exterior, for instance, is dominated by the Virgin and Child in the main gable, a carving after the manner of the best mediæval artists. To her right, in a field of fleur-de-lis, are the three rings that symbolize the Holy Trinity; to her left are the three roses of the Virgin Mary. Other symbols appear on the belt course, in the arch of the main entrance, in the tympanum of the oak door and elsewhere. Inside the vestibule doors, supporting the flanking niches, are the Ship of the Church and the Pelican with her young.

Over the lower arcade of the nave runs a foliated stone cheneau in which appear at regular intervals emblems of the saints. These include the apples of St. Dorothy, the Pincers of St. Agatha, the Square of St. Thomas and many others, all of which bear some relation to events in the lives or martyrdom of the saints, and each of which is a story in itself. Even the vaulted ceiling is replete with religious significance, the bosses in the six bays marking from the entrance bay to the chancel bay an ascending scale in the Ecclesiastical Hierarchy. On the ends of the choir screen appear the Crown and the Sword, and the Lilies and the Cross. The face of the lectern has carved upon it the Sermon on the Mount,

The pulpit, with the choir stalls and hood to the right. The floor is Travertine; the pulpit base, Caen Stone; the chancel floor and steps, Botticino. The walls of the nave are Bath Stone.

flanked by the Ten Commandments.

The altar is built of plainly worked Bath Stone covered by a single slab measuring 11 feet by 4, and having a molded plinth which shows beneath the "decent carpet of silk" prescribed by church rules and which here, following a mediæval precedent, does not reach the ground.

Even longer than the altar and about the same height, is an "upper frontal," or reredos, of pure white Nottinghamshire alabaster carved in low relief and decorated in gold and color. It measures 13 feet 2 inches by 3 feet 2½ inches and has five pictures, each in one piece of alabaster and enclosed by a trailing rose, the stem of which forms the Cross of the central picture of the Saviour.

This reredos owes its existence to our knowledge of the English alabaster reredoses which in the Middle Ages were sent all over Christendom as then known, and now adorn its museums. In design, however, it resembles them only in the treatment of its coloring. It is interesting in this respect that the mediævals followed the examples of the Greeks who colored their ordinary marbles, but when they employed so fine a marble as the Parian, which closely resembles the English alabaster, they left the flesh untouched except for a preparation of wax and merely penciled the features with color and gilded the hair and drapery. The Hermes at Olympia is a partially surviving example.

However, the Nottingham quarries, it would seem, did not yield pure white blocks of sufficient size to produce in single stones these slabs or the three main figures in full relief above the reredos. These latter are about 4 feet high and depict the Blessed Virgin, the Risen Saviour and Saint Elizabeth, in order from left to right. They stand in the main niches of the altar screen which enshrines the reredos and are surmounted by tall canopies. Between them and on each side are thirty-six smaller niches each containing an alabaster statue a foot and a half high, of the size more usual in the mediæval Nottingham examples, from which some of the gold borders are directly taken. Like their prototypes these figures have a smaller proportion of gilded and colored decoration.

The screen itself is of Caen Stone entirely covered with gold and color, after the traditional manner. It is often declared that the modern chisel or pencil cannot attain to the character and skill of the cutting and painting of the Middle Ages. Certainly the chiseling of much of the imagery, though it does not suffer by comparison with similar present-day work, does not quite disprove the assertion. But it is suggested as an interesting fact that the pencil work of the decoration and the cutting of the tabernacles bear comparison with the finest Middle Age workmanship. Moreover, it is interesting to note that some of the stones are very large to contain such intricate cutting without a fault, and are only second in this respect to their immediate predecessors of the Stanton Chantry at St. Alban's, Holborn.

The altar window, of five lights, has the central panel beneath the transom of solid stone, thus affording a contrast to the middle tabernacle of the altar screen which rises in front of it.

The body of the chapel is illuminated by wrought-iron hanging candelabras, of excellent execution.

Altogether, the Lindsey Memorial Chapel has a charm that cannot be conveyed by words and illustrations. The construction is dignified, the details reverential. Certainly the designers have, in this structure, added another glory to the record of American ecclesiastical architecture.

Charm

LONGFELLOW, speaking of Evangeline, wrote: "When she passed it seemed like the ceasing of exquisite music."

The charm of a beautiful structure never palls; when it is expressed through the medium of marble, it is everlasting.

A STUDY OF PRACTICAL PROBLEMS OF THE MARBLE INDUSTRY

A SERIES of investigations of certain problems involved in the installation and care of interior marble is now under way at the Bureau of Standards. It was undertaken through the initiative of the National Association of Marble Dealers, and has to do with the causes of certain types of trouble occasionally encountered when marble is used for interior trim; with the means of prevention and cure of these troubles and, finally, with the effect of cleaning compounds on the marble.

When interior marble is properly installed and cared for these troubles are seldom encountered, but with a view of rendering the best service to its customers the National Association of Marble Dealers has deemed it worthy of an extensive study covering all the points involved.

The investigation involves the following phases:

(*a*) The relative discoloring effects of different materials in the walls to which marble is attached.

(*b*) The value of different waterproofing materials in preventing discolorations.

(*c*) The removal of different kinds of stains from the exposed face of the marble.

(*d*) The cause and prevention of decay of interior marble.

(*e*) Cleaning processes, with particular reference to their harmful effects on marble.

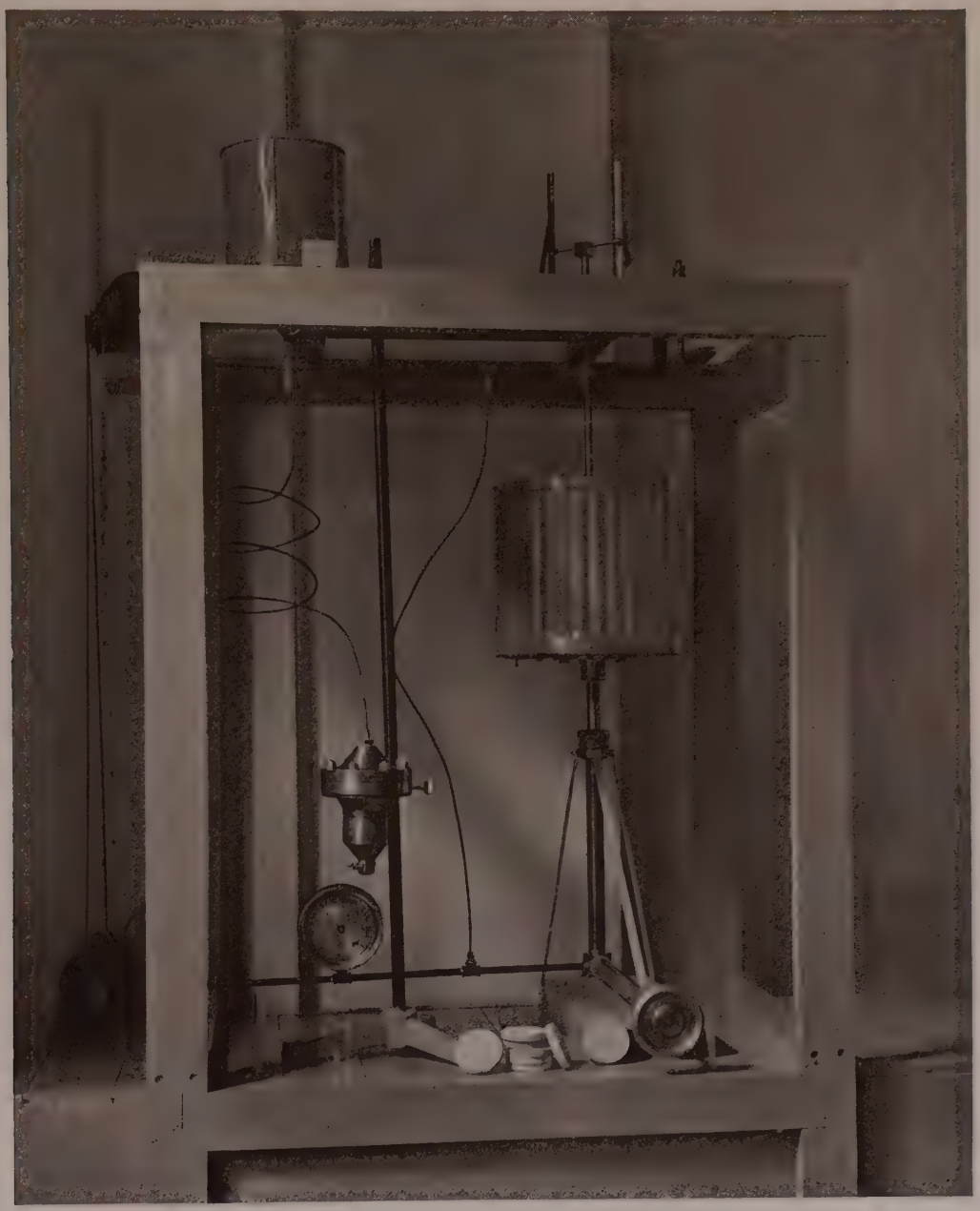
Marble used for interior trim is occasionally disfigured by soluble salts which leach to the surface and produce a stain. The marble dealer generally blames this staining on the other materials which were used in connection with the marble, and it seems likely that this is true, as marble itself is nearly pure calcium carbonate, or a combination of the same with magnesium carbonate.

In an effort to place the blame for such staining the Bureau is making tests with all the materials likely to be used in the backing walls. Two methods are being used. In one method small walls of usual construction will be built, having marble faces and backings of brick or other types of masonry. The back side of the walls will be kept damp, and the moisture will be allowed to evaporate from the surface of the marble. This method, while it comes the nearest to duplicating actual conditions, has the disadvantage of being expensive and not so very definite.

Hence most of the tests are to be made by the vat method, the walls being used merely as a connection with actual conditions. Small marble vats will be made, and in these vats the suspected staining materials will be placed with water and their effect noted. By this method comparisons of different types of marbles can be readily made, and a wide range of suspected materials tested.

This method is also to be used for testing the effectiveness of waterproofing compounds for preventing the penetration of stains into marble and will be used especially in tests of colorless waterproofing compounds intended for application to the back of the marble.

For testing the effectiveness of waterproofing compounds in reducing the permeability to water under pressure, another method has been devised. In this method a disc of stone 3 inches in diameter and ½



The permeability apparatus devised by the Bureau of Standards.

inch thick is used. It is placed in the apparatus in such a way that a water pressure of as much as 500 pounds per square inch can be brought in contact with its upper side. A cup-shaped vessel, having a sharp edged top 2 inches in diameter, is screwed into the lower part of the apparatus until it makes contact with the lower side of the specimen. The portion of water which comes through the stone and collects in the cup is measured at intervals during the test and gives the rate at which water comes through a definite area of the stone under a certain pressure. In some cases it has proved necessary to absorb the water by means of a dessicant, such as calcium

chloride, and to determine the amount of moisture from the increase in weight, as the amount was too small to be determined in any other way.

This method is to be used especially in tests of waterproofing compounds which are intended for application to the back of the marble blocks before they are put in place.

The leaching of salts to the surface occasionally causes disintegration of the stone as well as staining. The water carrying them evaporates, and the salts left behind crystallize in the pores of the stone, producing an action similar to frost but much more rapid and severe. It is a known fact that some of the strongest and densest types of stone have been injured in this way.

From the few cases that have been observed, it appears that the decay of interior marble work is confined chiefly to cases where walls below grade are faced with marble without providing a waterproof membrane or an air space in the wall to take care of ground moisture. In such cases it is no wonder trouble occurs. There is an unlimited supply of trouble-making material available.

The study of cleaning compounds for marble is to be undertaken mainly with a view to determining the ultimate effect of the different compounds which are commonly used for the purpose. This will in-

Apparatus for making long period scrubbing tests on marble.

volve a study of their chemical and physical effects through a long series of applications.

For the making of some of these tests an apparatus has been devised consisting of a large wheel, which is to revolve at a very slow rate. Marble slabs are to be fastened to the periphery of this wheel, and as it revolves each slab in turn is brought, at the bottom, in contact with felt mops carried by a smaller wheel, and dipping at the lower side of the small wheel into the cleaning solution to be tested. The effect will be identical with that obtained by scrubbing the marble in the usual way.

In rising from the scrubbing mops the slabs next come in contact with a warm blast of air which will draw out the moisture absorbed in the scrubbing process. Thus the processes of cleaning and subsequent air drying will be repeated over and over, an effect equal to that of fifty to a hundred years of normal service being produced in a period of a few weeks.

Slabs that have been tested in this way will be compared with slabs of the same material that have not been tested, being examined for surface conditions and tested for elasticity and transverse strength. The apparatus will carry 36 slabs of marble at a time, and these are to be chosen to represent the entire range of compositions and accessory minerals. A number of different cleaning compounds are also to be tested.

Another phase of the work is to be the study of actual cases of discoloration or decay of marbles in buildings, thus connecting the results of the tests with actual conditions and possibly leading to a better understanding of the structural conditions which should be avoided.

Comparatively little of value is hoped for from this part of the investigation, as there are very few cases on record in which interior marble has failed to give a good account of itself. It is also very difficult to obtain information as to structural conditions in such cases.

Careful inspections are planned, however, of all cases of marble failure of which information can be obtained, and anyone who knows of such cases can aid materially by pointing them out. This may be done by writing either to the National Association of Marble Dealers at Cleveland, Ohio, or to the U.S. Bureau of Standards, Washington.

BOUND VOLUME NO. 2 IS NOW OFF THE PRESS. HAVE YOU ORDERED YOURS?

(*See page 69 of this issue*)

The second bound volume of THROVGH THE AGES is now ready for distribution. The full text contents of the twelve issues of this magazine from May 1924 to April 1925, inclusive, have been gathered under one cover, elaborately bound in *de luxe* form.

No architect can afford to be without this collection of authentic facts about the use of that finest of building material—MARBLE. In addition, the text is profusely illustrated with beautiful—and, in many cases, rare—views that comprise a valuable addition to an architectural portfolio.

The addition is limited. For your convenience we are attaching an order blank on page 69 of this issue.

SEND IT IN BEFORE IT IS TOO LATE

A MELODY IN STONE

The People of Providence Profit by Musician's Will

THE Monument to Music which has been erected in Roger Williams Park at Providence, Rhode Island, is one of the latest additions to the rapidly growing number of beautiful structures in this country. It is made of Highland Danby marble, taken from the quarries of Vermont. It follows the Greek style of architecture, and in its superb situation is a creation of rare beauty.

The idea originated with William Curtis Benedict, of erecting in Roger Williams Park a monument which would be "dedicated to and illustrative of music." It was through a generous provision in his will that the idea was made possible of accomplishment.

Mr. Benedict was a native of Vermont, born and educated in that state. When a young man he entered business in Rhode Island, beginning his career in a savings bank in Pawtucket of which his uncle was president.

At the opening of the Civil War, being a

member of the Slater Drill Corps, he enlisted with that body. Serving with distinction, he rose to the rank of first lieutenant, and later became quartermaster for General Daniels. After the war he went into the starch and oil business in Providence. He was recognized at one time as the largest importer of olive oil in the country. Throughout his life he was known as an honest and reliable business man.

Mr. Benedict was a musician of considerable ability, possessed a fine tenor voice, and was deeply interested in the art. He lived to be seventy-five years of age and died in Providence in April, 1915. His will provided that a sum of $75,000 should be set apart for the purpose of erecting this monument. His instructions were that it should be erected in Roger Williams Park, and should be constructed both to instruct and to adorn. How well his wishes have been carried out, the finished monument testifies.

Owing to the World War nothing was done on the monument for some time after his death. After the close of the war plans were started and the site was selected. The design was submitted by the firm of Bellows and Aldrich, of Boston, and after some changes was accepted. Soon after the acceptance, the firm was dissolved and the work was carried on by Mr. Aldrich alone.

It is entirely fitting that this monument, erected by the generosity of a native of

The architect adopted the motives of Attica, with modern variations.

Vermont, should be composed of material brought from that state. It would be hard to find a stone that could more aptly express the message of the structure, or interpret more beautifully what one observer has called, "this melody in stone."

The base of the monument is set on a concrete foundation going down 14 feet to hard pan. The floor is composed of marble tile set on concrete slabs. From this floor rises the walls and columns. The columns are nearly 25 feet in height and have a maximum diameter of 2½ feet. The marble base of the structure is 73 by 53 feet, and the monument is 42 feet high. The roof is also of marble tile carried on steel trusses cast in concrete. The monument is ceiled with hard plaster which is decorated with a Greek ornament. The columns are Ionic in design.

The monument is situated on the shores of a lake, the water making a striking background for it when viewed from the shore. It is almost impossible to describe adequately the finished project. Certainly the architect has caught the spirit of those Greek artists from whose work the idea was taken.

It is designed with the utmost simplicity of general scheme, but carried out with a mastery of proportion and detail that is not frequently surpassed. The style is a modification of the peripteral type, with the columns flush with the main walls on the sides, but with a porch having two columns enclosed between the projecting side walls of the cells, as in the type of Greek temple known as In Antis. From the stylobate at either side descend six steps to the ground level, which has, as above mentioned, been set with marble tile as a base for the building. On one side a second flight of steps leads to a sunken semi-circular space enclosed by a marble parapet, within which are to be placed seats to accommodate the audience. The opposite side looks to the waters of the lake.

At the dedication recently, a huge throng, estimated at over 125,000 attended the service. The program was comprised of a concert, given by a chorus selected by Mr. J. B. Archer, assisted by the United States Marine Band, and Mme. Marie Sundelius. Every vantage point within hearing of the exercises was crowded with people and the lake was dotted with all kinds of small craft filled with those who could not obtain a position on the land.

The Monument to Music, Providence, R.I. Bellows & Aldrich, Architects.

Statue of St. John the Baptist at Florence
by Donatello.

SCULPTURE IN ITALY DURING THE EARLY RENAISSANCE

IN Spain, France, Germany and in England there occurred during the fifteenth and sixteenth centuries a change from feudalism to monarchy. In Italy the transition was not so marked, since feudalism itself was antagonistic to the Italian character. There existed there a number of Republics, States of the Church, Duchies and the Kingdom of Naples. Families and individuals acquired great power, and the patronage of the arts came through them and the Popes of Rome, especially Sixtus IV and Julius II. The individual artist became more and more prominent; instead of the "school" of art receiving the attention of the historian, greater recognition began to be given to the work of the single mind.

A second characteristic of the Early Renaissance sculpture was the enthusiasm for nature, the logical outgrowth of the development of physical and historical science, the increase of comfort and pleasure in all forms of social life. It has been called the spirit of "youthfulness"—a spirit that had the capacity for sentiment and the willingness to think. It was both poetical and intellectual. It brought forth such splendid masterpieces as the Tomb of the young cardinal of Portugal in San Miniato and the equestrian statue of the Colleoni—compositions that for grasp of character and mastery of material have hardly been equalled in modern times.

A third characteristic, implied in the name

Illustrations courtesy Thomas Machen, architect, Baltimore, Maryland.

Bas-relief by Donatello in the Museum of S. Maria del Fiore at Florence.

Renaissance, was the revival of classical forms, subjects and methods. Beginning with Niccolo Pisano, after the interruption due to German, Frankish and Lombard influences, this revival gathered force until, in the early sixteenth century, the classic spirit dominated all forms of art.

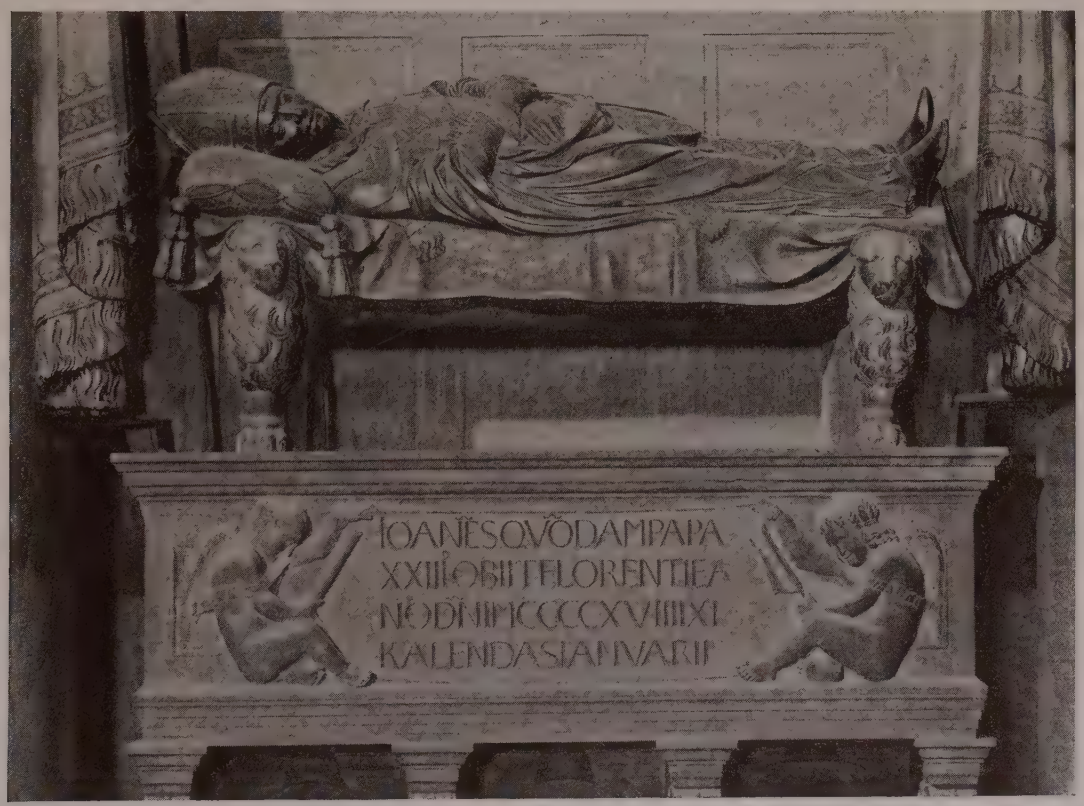
The technique of the marble workers of this period is shown by an examination of almost any tomb. They were masters of the harmonies of light and shade, and knew how to attain the greatest values in combining figure, relief and texture in panels, mouldings and drapery. It is easy to distinguish any piece of work of the Renaissance from the marbles of other times by the trade-mark of this unmistakable technique. Freeman says of this characteristic: "The Greek sculptor could no doubt have played with his chisel any trick that seemed worth while. We are not able to judge with conviction of the surface of Greek marbles nor of Greek use of color. That later Greek art begins to care more for texture than did Phidian art seems plausible from the careful and soft treatment of surface in the Hermes of Praxiteles. The Renaissance sculptor cared overwhelmingly for surface effect, and enjoyed producing it, as all workmen like to do what they can do easily and satisfactorily. The reasons for his facility are not far to seek. They are twofold. He is the descendant of the stone carver, and the apprentice of the goldsmith. From the first he inherits a dexterity of hand which renders marble like wax to his touch. In the shop of the second, his hand has been trained to habits of accuracy and delicacy, and his eye to the love of graceful and inventive detail. His eye, however, has learned its power of discriminating niceties of light from painting. So much has he learned from that source that he seems often to look at his work with a painter's rapture rather than with a sculptor's eye, for to obtain a variety of values approaching those at the command of the former, he borrows from him linear perspective, and he plans the color of his stone, the lights of high to low relief, of polish and of texture, as does a painter the color scheme of his picture.

"It is this sort of 'picturesqueness,' this quality dependent upon surface technique,

which makes the unique sense charm of the Renaissance marbles and gives us a set of imagined sensations as delightful as rare. Delicate modelling, skillful handling of planes, subtle balance of textures, suggest through their many gradations of light and shade a sequence of refinements, of touch sensations referred to the palm and the finger tips, which seem to belong to some sense inactive in our ordinary experience, since they give us an imagined sensibility of a degree of keenness that only the blind know."

It was the churches that received the attention of the sculptors in the fifteenth and sixteenth centuries. The exteriors were decorated with figures, especially over the portals, and frequently in niches over the whole façade. Reliefs of figured and decorative design were likewise employed for exterior embellishment and practically all of these were in marble. The interiors offered even greater opportunity for the stone worker. Sculptured altar pieces were common, as were also sculptured pulpits, choirs, fonts, ciboria, galleries and tabernacles. Statues of angels, saints and Madonnas were used freely, and occasionally these appeared in large groups. The large architectural tomb, commemorating the church dignity, the general, the statesman, the poet or the prominent private individual, was frequently the chief feature of the nave. On the floor was seen the sepulchral slab, carved in relief, with the figure of the deceased raised above the floor level or even set upon a base.

The Madonna and the Child was the most characteristic subject for ecclesiastical sculpture of the Early Renaissance. Later, she was shown accompanied by saints. Mytho-



Detail of the Monument to Baldassare Coscia in the Baptistery at Florence. Executed by Donatello.

A terra cotta by Andrea della Robbia (1508) over the main door of S. Maria della Quercia at Viterbo.

logical subjects were not often used, though decoratives motives of classic origin appeared freely. Cupids were prominent, being introduced in every conceivable design, with and without reason.

Private houses and buildings of a civic nature had sculptured doorways, chimney pieces and figures profusely scattered around the house. The palaces had portrait statues and busts and open squares or private gardens replete with fountains, seats, vases and other beautiful subjects executed by capable and well-known artists.

The demand for delicate and refined form naturally led to an extensive rise of marble and the finer calcareous stones. Marquard, writing of this period says: "The white Carrara marble was extensively used for monumental sculpture, but was softened in color by the use of wax. Details, such as the hair, angels' wings, ornaments of robes and architectural mouldings were usually gilded. The background, when not sculptured, was commonly colored a grayish blue. Highly polychromatic marble sculpture was rare."

Glazed terra cotta began to be used as a cheap substitute for marble. When colored beneath the glaze, the polychromatic character endured for some time. This material began to be used in the country towns for altar pieces, pulpits, fonts, coats-of-arms and tabernacles. A fine stucco, made of marble dust and sand, was even cheaper and likewise took the popular fancy, so that inferior reproductions of some of the masterpieces began to find their way into the hands of the common people.

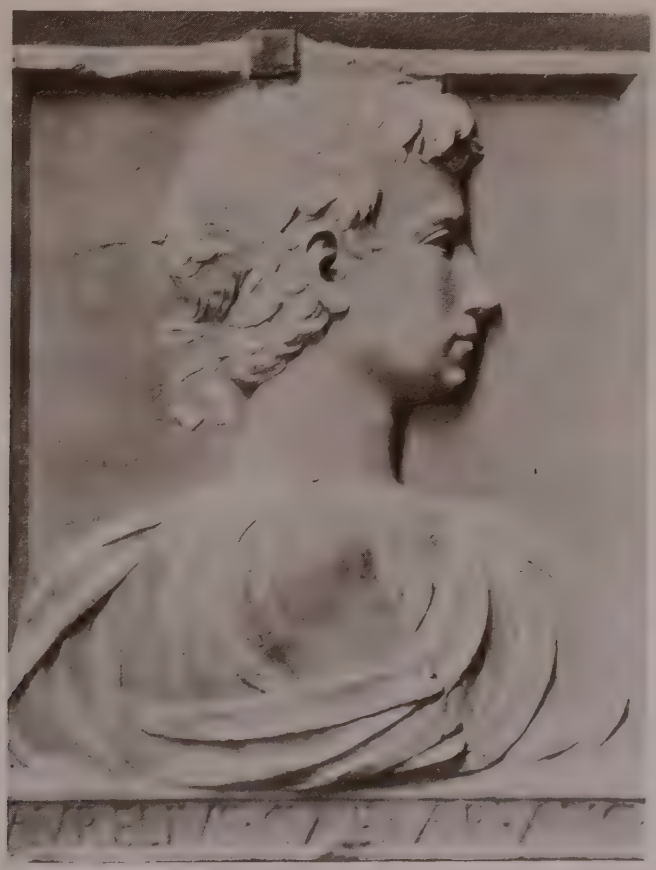
Among the leading sculptors of the first half of the fifteenth century. Ghiberti, Donatello and Lucca della Robbia were the most renowned. Ghiberti, beginning as a painter, was, as Cellini says of him in his Orificeria, "truly a goldsmith, not only in his graceful manner of producing objects of beauty, but in the extreme diligence and polish which he gave to his work." His chief work is the second pair of doors for the baptistry at Florence, which Michelangelo declared to be fit to be the gates of Paradise. Among his minor works are several grave slabs which

mark the resting places of distinguished Florentines, such as that of Fra Leonardi Stagi before the high altar of Sta. Maria Novella, and that of Ludovico degli Obizzi at Sta. Croce.

Donatello, the greatest of Tuscan sculptors before Michelangelo, reflects in his works the changing spirit of his age. It was after 1425 and up to his visit to Padua in 1444 that he produced his finest works. He executed orders for many tombs, altars, pulpits and equestrian statues for such widely scattered towns as Prato, Rome, Naples, Siena, Orvieto and elsewhere.

His later years, until his death in 1466, saw his work decline. By some he is regarded as even a greater sculptor than Michelangelo, for the former made marble yield all that it was capable of yielding, both as regards technique and style, whereas the latter looked upon the stone simply as a vehicle for the transmission of his thoughts and paid practically no attention to its special qualities either in respect to surface treatment or the adaptation of his subject to its nature.

Lucca della Robbia, famous for the Robbia ware which he invented, was born in 1399. As a marble sculptor, his tomb of Bishop Benozzo Federighi in the church of S. Francesco di Paola and his choir-gallery reliefs show him to have been a master of composition and the possessor of a pure religious feeling. The school of glazed terra



Relief of Aurelio Cæsar Augustus by Mino da Fiesole, now in the National Museum at Florence.

Tomb of Francesco Tornabuoni in the Minerva at Rome, by Mino da Fiesole (1480) in collaboration with Dalmata. This is Mino's most manifest imitation of Desiderio.

cotta sculpture founded by him exercised a wide influence. The first bas-reliefs in Robbia ware were made by Lucca about 1440 for the lunettes of the doors leading into the sacristy of the Cathedral at Florence. Andrea della Robbia, Lucca's nephew, made a wider use of terra cotta and carried it into the smaller towns. Some of his work exhibits the dignity of his uncle's creations, though in the lunettes over the doors of S. Maria della Quercia at Viterbo, one of which is shown on page 30, the style lost something of its refinement and approached sentimentality.

The second half of the fifteenth century saw an increased demand for monumental works in sculpture, both bronze and marble. The outstanding figures of this period were Mino da Fiesole, Desiderio da Settigrano, the Rossellini, Benedetto da Majano and Verrocchio in Florence; Vecchietta and Federighi in Siena; the Mantegazza brothers and Solari in Lombardy; and Pietro Lombardo in Venice.

Mino da Fiesole (1431–84) is classed by Vasari as the scholar and by some writers as the imitator of Desiderio, who was his in-

timate friend. But while Desiderio produced very little, Mino executed many works which, though possessed of certain charm and grace, almost weary by their sameness of type. His earliest dated work was the bust of Strozzi. His Roman productions, one of the best of which is the tomb of Tornabuoni in the Minerva, are more elaborate but inferior to his Florentine. His masterpieces are in the Cathedral at Fiesole—the tomb of Bishop Salutati and an altar piece showing the Madonna and figures of saints.

Desiderio (1428–64), the most distinguished of Donatello's pupils, added to his master's best manner an elegance distinctly his own. His marble tabernacle in S. Lorenzo is a miracle of beauty, and his busts of children show a strength and character in the faces that remind one of the boys on the Cantoria.

Benedetto da Majano (1442–97) was trained as a stone mason and his works, while reflecting the spirit of the time, showed no marked individuality. The fine pupilt in S. Croce, given by Mellini, prove him to have been an accomplished architect. The finest of his sculpture from the Pallazzo Vecchio, the statues of the Baptist and of Justice, and angels with garlands and candelabra, are now in the Bargello, at Florence.

Andrea del Verocchio (1435–88), trained as a goldsmith, was the greatest metal worker of his day. His bronzes were original and independent. The best known is the statue of Bartolommeo Colleoni in Venice, the great Free Captain, which stands by the Church of SS. Giovanni e Paolo, finished in 1496 after his death. Water says of this masterpiece: "Vigor and movement have never been more adequately expressed; and though the dominant impression is that of strength, the consummate grace and balance, with which horse and rider seem to move together, mark perhaps the subtlest touch of genius." Leopardi's pedestal for this creation is a fine work and drawn ex-

Monument of Ludovico Moro and Beatrice d'Este, in the Certosa Pavia; by Cristoforo Solari the Milanese (1497).

actly on the scale to display the statue to the best advantage.

Lorenzo Vecchietta (1412–80) followed in the footsteps of della Quercia, and his work, though excellent, had a hard manner that is at times repellant. Antonio Federighi (1415–90) was affected by the Pisan traditions. The two beautiful Holy Water Stoups, among the finest and most original of the Renaissance sculptures, and the reliefs on the font in the Chapel of the Baptist at Siena, and the tomb of Bishop Bartoli in the right aisle of the cathedral are best known. His draped statues were less successful than these and do not show as complete a grasp of technique.

The Mantegazza brothers, who with Cristoforo and Antonio were the chief sculptors of the Certosa di Pavia, had a hard conventional style. They were among the first to represent drapery in the cartaceous manner, so called from its resemblance to wet paper. Cristoforo Solari is noted chiefly for his monument in the Certosa of Ludovico Moro and Beatrice d'Este. These effigies are exquisitely modeled but are carried out in the conventional style of the period. Probably much of the best of the interior sculpture on the Certosa is by Solari.

Pietro Lombardi (1435–1515) was trained as an architect. His sculpture showed less originality than that of the contemporary Florentines, but nevertheless reveals ideas that were richer and more poetical. His finest work is the tomb of Pietro Mocenigo in SS. Giovanni e Paolo; the decorative sculptures, too, at S. Maria dei Miracoli in Venice exhibit an exquisite charm and fancy.

Equestrian statue of Colleoni in Venice by Verocchio.

A CHAMBER OF COMMERCE BUILDING

The Structure on Brandford Place, in Newark, New Jersey, is Embellished With a Variety of Marble

BEAUTY and usefulness are combined to such a nicety in the ten-story Chamber of Commerce Building at Newark, New Jersey, that it is not difficult to understand why its suites have been so much in demand in that city among those who consider it of importance to have business offices furnished with all the conveniences that modern ingenuity can devise and pervaded with an artistic atmosphere to lend the proper tone. Since its completion in May, 1923, the building has been occupied by the most exacting tenants.

Aside from its utilitarian and æsthetic attractiveness, the building, or more properly the building site, is linked with the past. There is a connection with the historic and perhaps more romantic Newark of the days of Robert Treat, the stalwart New England leader who brought a little band of seekers after religious freedom to the banks of the Passaic River and founded Newark. For the Chamber of Commerce Building site once was a part of the expansive churchyard of the historic old First Presbyterian Church, which has played such a vital part in the life of the Newark community.

The building faces Brandford Place, also

The entrance is carved of Pink Tennessee marble.

famous in old tales of the city, a short half-block from Newark's 100-foot thoroughfare, Broad Street. It is on a plot 80 by 100 feet, built of a cream-colored brick with terra cotta trim. The base course is of polished granite, and the main entrance feature is cut in Pink Tennessee marble, and is of real interest in that the meeting ot Robert Treat, founder of Newark, with the Indians is portrayed over the entrance on either side of the globe, which is surmounted by the American eagle. The wave motif, with the plunging dolphins, forms the base of this group. The design around the entrance itself is neatly carved with medallions representing the twelve signs of the Zodiac. In the spandrels of the arch are two medallions representing two methods of transportation —the sea and land. The doorway is the work of Mr. Maxfield Keck.

At the upper portion of the building a band of Levanto marble runs around between the columns of the ninth and tenth floors, thus letting the two stories count as one for the column treatment and making a most effective cap to the building, as seen from Broad Street. The building has been fully tenanted from the very first and is one of the much desired office buildings of the city.

Entering the main hall or lobby, one is struck with the beautiful Botticino marble

which faces the walls. The base is of Levanto marble. The floor is checkered with blocks of York Fossil and light Pink Tennessee marbles with a wide border of Levanto and a small border of Westfield Green.

Above the wainscot springs a vault of gold with bas-reliefs modeled in the spandrel arches, representing the several modes of transportation. There are two interesting lighting fixtures in the vestibule and main hall. One in the vestibule is the ancient globe in colors with a border around it horizontally, cut in bronze, with bas-reliefs of the early American explorers. The center fixture in the main hall is of a very delightful design, showing the old vessel of discovery under full sail. The elevator doors are of polished bronze.

All of the corridors in the building are of Botticino marble with terrazzo floors.

The entire third floor is utilized by the Chamber of Commerce of the city of Newark. Here are the Chamber staff offices, reception room, assembly hall, committee rooms, board of directors' room, and built-in vault for valuable records. These are the center of an intense civic activity that spreads throughout the city and beyond.

Botticino, Levanto, York Fossil, Tennessee and Westfield Green marbles in the lobby of the Newark, New Jersey, Chamber of Commerce Building.

A LIST OF THE WORLD'S MARBLES

By J. J. McCLYMONT

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

GROUP A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

GROUP B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

GROUP C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

GROUP D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

Lunense Marble—Ancient for Carrara marbles—See Luna.

Luni—See Luna.

Luxullianite (Porphyry)
Quarried at Luxullian near Lostwithiel.
Dark brown to bluish-black dotted with pinkish crystals.

Lychinites or Lychnites
Parian marble was known to the Ancients as Lychnites, probably due to the fact that it was quarried by lamplight. Some ancient writers assert that it was so named because of its large sparkling crystals.

Lycopolis
Ancient city on the site of the town of Assiut—See Egyptian Onyx.

Lyme Regis—Same as Cotham.

Lychneus or Lychnites or Lygdos—Same as Parian.

Lydia or Lydian—See Marmor Lydium.

Lynnfield
At Lynnfield, Essex County, Massachusetts, according to Hitchcock's Geology of Massachusetts, occurs an important bed of nobe or precious serpentine.

Lyonnais or Red Champlain
Barney Marble Company's Quarries, Swanton, Vermont.
Brownish-red with spots and lines of white.
Takes high polish.

Mabre Vierge
Quarried at Bayonne, Lower Pyrenees, France.
Pure white statuary. (Blagrove.)

Macael Blanco
Comes from several quarries near the village of Macael in the Almazora Valley at the foot of the Sierra de Las Filabres, Almeria, Spain.
Is classed as a white marble, but is not pure white, and occasional gray bands traverse the mass. (Watson.)

Macchiato Nerastro—See Bigio Antico Macchiato Nerastro.

Macchiato Scuro—See Bigio Antico Macchiato Scuro.

Macclesfield Cream
All of the Macclesfield marbles are quarried near Macclesfield, about six miles from Mount Barker, South Australia.
Light fawn color with a few brown veins. (Watson.)

Macclesfield Dark Gray
Dark gray slightly marked with brownish veins.

Macclesfield Gray
Gray with white bands and alternating bands of darker and lighter shade.

Macclesfield Pink
Light pink.

Macclesfield Red
Light pink with dark gray veins.

Macedonia
Name given to some of the ancient Grecian marbles.

Maceiro—See Almiscado Amerello, Almiscado Escuro, and Vidraco.

Machurea Magna
Name of fossils occurring in some marbles.

Maclura
An extinct marine gastropod in which the whorls of the shells lie in one plane. Some of the maclureas of the Lake Champlain region attain several inches in diameter.

Macon—See Framayes.

Madison County
A true crystalline variegated marble occurs in limited quantities in Madison County, Missouri, of which no developments have been made.

Madre Cream Alabama—See Alabama Madre Cream.

Madrepore
Name given to marbles containing fossils which produce the effect of white and gray spots, in the middle of which are small dots or stars. (Blagrove.)
Some of the Petitor marbles consisting entirely of fossil corals are known as Madrepore.

Madrepore Marble or Fossil Coral or Coral Marble.
Quarried near Charles City, Floyd County, Iowa.
Light drab with abundant fossils varying from yellowish to deep mahogany brown.

Maen Midgee Serpentine
Quarried at Maen Midgee, Kerwith Sands, England.
Deep reddish-brown studded with crystals which shine with a metallic lustre. (Blagrove.)

Magdaline Quarries
Near Etla, Oaxaca, Mexico.
Produce a Mexican Onyx known as Etla Onyx, which has been extensively used. It is a delicate transparency of tints from the softest colors to the brightest hues.

Maggiore Lake Marble
At Candoglio on the River Toce, which runs into Lake Maggiore, Candoglio Marble is quarried.

Magharah—Quarry.

Magnesium
A silver white metallic element.

Magnetite
A black metallic mineral known by its strong magnetism and its black streak—one of the principal ores of iron.

Mahogany
Upper Quarry near Freedley, Vermont.
Milk-white. (U.S. Geological Survey.)

Mahogany Red or Red and White.
Quarried near Burnet, Texas.
Dull red with netted veins of lighter shade. Not available.

Maidstone—See Hassock.

Maine Marbles
As far as we are informed, no marbles are now available from this state.

Majorca Island—See Mallorca.

Makrana—See Gray Makrana, Pink Makrana, and White Makrana.

Malachite
A hydrated basic carbonate of copper. The finer varieties are used for decorative stones and generally known as marbles.
See Russian Malachite, Australian Malachite, and Rhodesian Malachite.
Malachite is found in most copper mines, but the varieties useful for decorative purposes are of limited occurrence. In Russia ornaments made from this stone were supposed to protect the wearer from lightning, contagion and witchcraft.

Malaga—Same as Breche Rose Spanish.

Malay Marbles or Malay Peninsula or Malay States—See Veined Perak and White Perak.

Mallorca (Breccia)
Quarried near Santany, Island of Majorca, in the Balearic group, off the coast of Spain.
Red ground with angular fragments of white and green. (Watson.)

Malpas
Quarried near Malpas, Doubs, France.
Light pink spotted with red—takes high polish. (Blagrove.)

Malplaquet
Quarried at Malplaquet, Belgium.
Pale reddish-yellow sprinkled with irregular patches of lighter color, the edges of which are of a darker tint.

Malplaquet Premiere Qualite or Malplaquet First Quality.
Quarried at Malplaquet, Belgium.
Black covered with large reddish-gray patches with shaded edges.

Malplaquet
Quarried in the Valley of Biros, Ariege, France.
Bluish-gray with large black and pinkish-white spots. (Blagrove.)

Malta Onyx—Same as Albatre de Siena.

Manaria—See Noir Beini.

Manche
Quarried near Iles Chaucey, Manche, France.
White speckled with varied shades of gray with white and gray crystalline zones. (Blagrove.)

Manchester Blue
Upper Quarry near Freedleyville—one of Vermont's oldest quarries.
Very light bluish-gray. (Vermont State Geological Survey.)

Manchester Breccia—Group D
From Dyer Quarry, Manchester, Bennington County, Vermont.
The cement is brick-red and the fragments of very unequal size are of three sorts—light pinkish or cream colored, a deep reddish, and light bluish-gray.
Takes good polish. (U.S. Geological Survey.)

Mandalay White
Sagyin Quarries, near Mandalay, Upper Burma.
Dull white, distinctly translucent, very fine grain.
Takes good polish.
Large quantities of this marble are used for making images of Buddha.
Another variety from same quarry is snow white, fairly crystalline, exceedingly hard, but coarse grained.

Mandelato
Quarried at Luggezzana, in the Veronese.
Light red with yellowish-red spots. (Blagrove.)

Mandolato Cippolino—Same as Campan Vert.

Mandolato Verde Cippolino—See Cippolino Mandolato Verde.

Mandolato Verde Giallastro—See Cippolino Mandolato Giallastro.

Mandolato Chiaro Cippolino—See Cippolino Mandolato Chiaro.

Mandolato Lionato Cippolino—See Cippolino Mandolato Lionato.

Mandolato Rosso Cippolino—See Cippolino Mandolato Rosso.

Mani—See Rosso Antico.

Mankato Stone or Kato Stone.
Quarry at Mankato, Blue Earth County, Minnesota.
No. 1 Buff Variegated, No. 2 Gray Variegated.

Mannersdorfer
Similar to Hundsheimer.

Manziana or Lapis Anitanus.
An ancient stone composed of feldspar and mica, and presenting the appearance of a granite rock which has been exposed to fire, for which reason it is sometimes called "Granitica." Corsi says that all of the fire hearths in Rome are made of this material.

Maragha Marble or Tabriz.
An Onyx marble found at Dash-Kesen, near the main road from Tabriz to Maragha—about 28 miles from Maragha, Persia.
Clear, almost transparent, and when cut into thin slabs is used for windows in various parts of Persia.

Marathonisi Quarries—See Green Porphyry (Greece).

Marbach or Marbacher
Quarried near Marbach, Lower Austria.
A coarsely crystalline limestone, mottled with light and dark gray.
Used chiefly for monumental work. (Watson.)

Marble

In the trade the term "marble" is applied to any calcareous rock capable of taking a good polish. Breccias, conglomerates, and even serpentines, although capable of taking a polish and generally marketed as marble, may or may not be, strictly speaking, true marbles.

A true marble is a granular aggregate of crystals of calcite or dolomite, chiefly the former. Usually the crystals are of uniform size in the same marble, but may vary widely in marbles from different localities or from different beds. Variegated marbles owe their special properties to variation in color and size of crystals in different areas. All true marbles were originally limestone and pure white. Most limestones were formed by a sedimentary deposit on the bed of the sea. Subsequent physical and chemical changes render them suitable for use as marbles.

The variations in character of marbles are the result of difference in the sediment of original deposit and the different changes that followed.

Marble, Colorado

Colorado Yule and Crystal River Quarries are located near this town.

Marble Dale

The first American marble quarry—See Connecticut.

Marble Falls

On Flat Rock Creek, Burnett County, Texas.

Unclassified marble deposits are reported.

Marblehead—See Kootenay.

Marble Hill, Georgia

One of the Georgia quarries is located at this place.

Marble Hill, New Jersey—See Jersey Green.

Marble Island, Alaska—See Gravena and Tokeen.

Marble Island, Norway

With an area of about 20 square miles which is chiefly composed of crystalline limestone, is one of the Spitsbergen group off the west coast of Spitsbergen or New Friesland, Norway.

It is sometimes known as Hop Island.

See Spitsbergen Breccia, Dove, Fawn, and Red.

Marble of Carystus or Marmor Carystium—Same as Cippolino Greek.

Marble, Oklahoma—See Oklahoma Marbles.

Marble Onyx or Onyx Marble—Same as Onyx.

Marbre Marble

Marbre a Hippurites—See Izeste.

Marbre de Cassis

Quarried near Cassis, Bouches du Rhone, France.

The ground mass is granular and the numerous sections of Lamellibranchs and other shells render it attractive as marble. (Watson.)

Takes good polish.

Marbre de Turbie—Group C.

Limestone quarries at Turbie, not far from Nice, Alpes Maritimes, France.

Is used principally for building stone but occasionally for decorative work.

The light variety is of varying shades of light buff. A darker variety from the same quarry is of varying shades of buff with patches of colorless calcite and marked with slender red and white veins. Does not take high polish. (Watson.)

THROVGH THE AGES

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The Grand Staircase leading from the rotunda to the balcony level. The treads are gray Italian marble; the rest of the material is white marble from Vermont.

THROVGH THE AGES

A Monthly Magazine devoted to the uses of Marble - its universal adaptability, beauty, permanency and economy.

VOL. 3 JULY, 1925 NO. 3

THE ENDURANCE OF MARBLE

A Few Instances of the Qualities Possessed by the "Stone of Time" Under Unusually Severe Conditions

NOT long ago one of the brick dwelling houses of Long Island was gutted by fire. The whole of the interior was destroyed, except a marble staircase. This staircase had been in place for nearly twenty-five years, and came through the fire without injury. This incident is but one of a series in which marble has proved itself, if not immune, at least remarkably resistant to the action of fire.

One of the first examples in this country of the great heat resistance offered by marble was in the Boston fire of 1872. At that time all buildings between Washington Street and Boston Light, with the exception of the front wall of the Macullar Parker building, were burned to the ground. This front was built of marble, and stood erect and unharmed amid the crashing ruins. People of today who pass the Filene Men's Furnishing Store see what appears to be a new building. Yet a section of that front, from the second story up, is the same marble which went through the fire of 1872. The other section was added later, the marble having been selected at the Vermont quarries to match the old stone.

In the fire of 1903 at Paterson, N.J., the Second National Bank with its walls of Vermont marble passed through a test of fire and smoke while the buildings around it were demolished. Structures which stood at even greater distances from the fire were damaged by the heat, yet the marble of the bank was left without a scar.

In the great Baltimore conflagration, which swept over the heart of the city, beginning on Sunday morning of February 7, 1904, and continuing through two days, several buildings with marble exteriors were left standing amid a debris of brick and twisted steel. The burned area covered 140 acres, comprising 80 city blocks, and was built up quite solidly with substantial brick buildings mostly of ordinary jointed construction. There were 27 buildings of fire-resistive material, ranging in height from 1 to 14 stories. The fire was quite generally a horizontal one as regards its attack and progress in each building. As a rule every

This old brick chimney, with fireplace cased in native marble, was erected at Dorset, Vermont, back in the Revolutionary days. This picture was taken about five years ago after the deserted wreck of a house had been cleared away.

story was ignited simultaneously through the exterior windows and the fire swept across each building and out at the opposite side.

Under these conditions the protection of floor openings availed but little, though the various kinds of fire shutters and wire-glass windows did some excellent work, along the edge of the burned district, in checking the fire.

The chief damage to the marble that was used both exterior and interior was due to falling walls of adjoining buildings and the collapse of side walls and the crashing down of the upper floors upon the lower floor levels, where most of the interior marbles were to be found. The International Trust Company of Maryland Building, now occupied by the Baltimore Trust Company, had a front of marble, with heavy marble columns and an elaborate cornice. This exterior marble was badly chipped by the falling of the walls of the next building on the west; the interior marble finish in the banking room was partly demolished by the walls of the west side falling through the skylight. This bank was the only building in the entire block that was left standing—and it was the only building in that block with a marble front.

In the next block on Baltimore Street was the bank building of Alexander Brown

and Sons, a brick structure trimmed so heavily with marble columns, window sills and lintels and an ornamental marble balustrade at the top, that it was practically a marble structure. The interior finish was largely of marble, comparatively elaborate. The fire in this locality burned for about 12 hours, consuming wooden doors, desks and burning out completely two small rooms on the south. The walls of the building on the west fell over on the roof and broke through about one-third of the skylight and ornamental glass beneath, damaging the interior trim to some extent. In addition, one of the large marble-faced columns had to be replaced. The outside damage was rather light. The sound value of the building was $150,000; the report of the Committee on Fire Resistive Construction of the National Fire Protection Association gave the total damage as a little over $20,000, or a little over 13½ per cent. Here again the adjoining buildings of brick were completely leveled, not one of them on the Baltimore Street side of the block remaining even up to the first floor.

Another example of the resistance of marble was shown in the fire of 1905 at San Francisco in the record made by the Security Savings Bank. A picture of this Vermont marble product was taken soon after the fire. It is almost unbelievable that a stone could come through such extreme heat and show no effects of the fire upon its surface.

The resistance of marble to intense heat is, obviously, one of its important qualities that deserves consideration by the architect and builder, but one which is very often neglected. "Fires in cities work great

The marble front of the Macullar, Williams and Parker Building, Boston, as it looked after the fire of 1872. Notice how the marble has withstood the intense heat.

The men's store of William Filene Co., Boston, which marks the site of the old Macullar, Parker Building. One section of this marble front went through the fire.

damage to stone structures," says D. H. Newland, in the New York State Museum Bulletin on "The Quarry Materials of New York." "The test of extreme heat followed by a sudden chilling from the play of water upon the surface is one that very few stones will pass through with strength and appearance unimpaired. There is, however, considerable variation among different building stones in respect to fire resistance, as may be observed in their condition after a large conflagration like that of Baltimore or San Francisco. Some buildings are completely ruined, so far as the possibility of making any use of the stonework for reconstruction; others are only damaged as to their exposed parts like the cornices and window openings, and some appear to be practically uninjured.

"Intense heat causes both physical and chemical changes in stone. The most apparent effect is the spalling and cracking incident to unequal expansion between the inner and outer parts of the blocks. Stone has a very low capacity for transmitting heat, consequently, the interior may be still comparatively cool while the surface is intensely hot. This difference in temperature sets up a stress that disrupts the stone or causes the outer part to flake off in successive layers. The same process

The Second National Bank of Paterson, New Jersey, which was tested by the fire of 1902—and came through unscarred.

The Security Savings Bank, San Francisco, from a photograph taken shortly after the great fire. The marble was subjected to the hardest kind of heat test.

takes place in nature where changes of temperature are extreme in the arid regions like the Great Basin, the warmth of the sun after a cool night causes the scaling of bare rock surfaces, but of course at a comparatively slow rate.

"The disruption of rocks of complex mineral composition, such as granite, is probably traceable to some extent to the loosening of the bond between the ingredients through intergranular strain. Quartz, feldspar and mica each has its own rate of expansion which must produce a certain amount of differential thrust under rapid temperature changes. Further, most granites hold occluded liquids and gases in closed cavities which were imprisoned during the consolidation of the mass from its state of liquid fusion. These are mainly found in quartz, which is the last ingredient to separate out from an igneous magma. Under high temperature, they exert, no doubt, a heavy pressure upon the walls of the minute cavities and thus co-operate with the other influences in the work of disintegration.

"From consideration of the physical characteristics, it would appear that the varieties of rock having a close, firmly interlocked fabric and simple mineral composition would prove the most resistant to fire. Among the igneous rocks, granite might naturally be expected to succumb more easily than a rocklike cyenite or anorthosite which is composed mainly of feldspar, and actual tests seem to bear out that inference. Some sandstones are very nearly fireproof and limestones and marbles generally bear up well until the heat is sufficient to effect crumbling through calcination. The temperature necessary to produce incipient calcination of small cubes of limestone, according to Buckley, lies between 1,000 and 2,000 degrees Fahrenheit. McCourt states that tests on some New York limestones did not show calcination at 550 degrees Centi-

International Trust Company Building, now The Baltimore Trust Company. This marble front building was the only structure left standing in a block of ruins.

grade (1,022 degrees Fahrenheit)." (Fire Tests on Some New York Building Stones, page 22.)

In actual use marble has time and again demonstrated its power to withstand heat. A century and a half ago the early Vermont settlers began to use marble in the building of fireplaces. They soon discovered its value when used in this way, and would often go to considerable trouble to get the material. They found that it was not only a beautiful addition to the log home, but that they did not have to rebuild their fireplaces, as was the case when other stones were used.

As a fire resistant, marble ranks at the head of all building stones. Laboratory tests have proved that marble can be subjected to a heat of 1,200 degrees Fahrenheit without injury. At West Rutland, in Vermont, are two huge rotary kilns in which marble not available for other purposes is made into lime. These kilns must be given a heat of 2,000 degrees Fahrenheit in order to decompose the finely crushed Vermont marble which goes into them.

The destruction of property by fire during the past year was enormous. Millions of dollars which might have been applied to other projects were required to replace destroyed buildings. It is not surprising that people should turn more and more to marble as a building material, adopting it as the best possible insurance against loss.

Marble is not only a protection against fire in itself but the insurance rate on a building built of fireproof material, such as marble has proven itself to be, is much lower than on one constructed of an inflammable material. In some instances the rate on marble buildings is less than a third of what it would be were the structure composed of wood. In these days of high insurance rates this saving is considerable.

Another feature which makes marble the

preferred stone in a building where enduring qualities are desired is the low cost of upkeep, and the small percentage of depreciation. No redecorating is required for marble, and an occasional cleaning is all that is needed to keep it in its original condition. The depreciation of wooden buildings has been estimated to be 10 per cent, and while this may be high it is certain that a wooden structure, if left unrepaired, becomes uninhabitable in a very short time. This depreciation is not found in marble, and long after a wooden building has fallen down and rotted away, the one built of marble will stand as testimony to the enduring qualities of the stock from which it is constructed.

The sanitary quality is not one to be slighted in the selecting of a material for building. No material is superior to marble in the possession of this quality. It is well adapted for public rooms, toilets and baths of all descriptions. It does not absorb moisture, so does not retain the unsanitary elements which may be found in many materials. It is easily cleaned and cleanliness is the first requisite of sanitation.

The appearance of a building determines to a large extent the success of the builders. People instinctively turn toward that which is beautiful, and in the same mind shun that which is distasteful. In marble there is a possibility of rare beauty in expression. It matters not whether the stone is applied to interior or exterior work. It adapts itself with perfect harmony wherever used.

With the fire hazard growing larger each year in buildings which are not properly protected, the other qualities of a building material become subservient to that of fire resistance. In marble, however, there is found this essential quality combined with those needed to endow the building with the desired economy, beauty and sanitation.

View looking east from Baltimore and Liberty Streets after the Baltimore fire of 1904.

THE PENNSYLVANIA CAPITOL

The Magnificent Building at Harrisburg Contains a Huge Dome Nearly Three Hundred Feet High

A FEW weeks after William Penn landed at Chester in the fall of 1682, the first Assembly of the Province of Pennsylvania was held and passed the "Great Law." The following year the seat of government was established in Philadelphia, where it continued for sixteen years. In 1799 Lancaster was, by an act of the Assembly, made the official capital; for thirteen years it held this important position. In April, 1812, all the offices of the state were removed to Harrisburg, where they have remained ever since. Such is the early history of the State Government of Pennsylvania.

The first Capitol Building was erected in 1821. Various additions were made from time to time, including a wing for the State Library. This library was moved in 1894 to a building of its own adjoining the Capitol on the south. In 1897, the main Capitol Building was destroyed by fire; work was begun on the present magnificent structure in 1898. It was not until 1902, however, that the commission awarded the contract to Joseph M. Huston, architect, living now in Philadelphia. It was dedicated on October 4, 1906, to the service of the Pennsylvania Commonwealth by the President of

the United States, Theodore Roosevelt.

In size, the building is monumental, covering some two acres of ground and having a circumference of about half a mile. It is 520 feet long, 254 feet wide and 272 feet high —dimensions that prove it larger than St. Paul's Cathedral and longer than Westminster Abbey. The nucleus of the design is an octagonal central space, or rotunda, surmounted by a huge dome. Leading to this rotunda is the main entrance lobby and vestibule on the west. To the north and south of the rotunda are built considerably extended arms, each of which ends with a cross piece forming the letter T. Opposite the main entrance, a wing extends to the east. Thus, facing the plan on the western side, we have directly before us a short west wing, forming the main entrance; a longer east wing, which is invisible; and two wings at the extremities of the structure, each attached by connecting wings to the central rotunda, and perpendicular to the former.

The building stands on a knoll called Capitol Hill, in the midst of a park of about fifteen acres, overlooking the major portion of the bustling city round about and within three blocks of the broad-flowing Susquehanna River to the west. The approach from State Street, which is on a line corresponding to the central line of the principal façade of the Capitol, is by far the most impressive, since here the trees of the avenue hide all but the beautiful portal surmounted by the gleaming columns and, towering into the sky, the rounded majesty of the dome, the dominating feature of the exterior design.

It is not until one has ascended the steps that climbs the hill that the full reach of the western front is appreciated, and the plan of the whole structure is apparent. The architect has followed mainly the Renaissance style, with the natural modifications incidental to a building of this character and

The Senate Chamber.

Decoration in the tympanum of the wing.

with original variations prompted by a fine sense of reserve. The column capitals and mouldings are of the simpler Greek forms of the Corinthian order, though the Roman influence is seen in the placing of the free standing columns under the plinths, and in the use of an anta behind each column. These columns are used in pairs, in contrast with the single engaged columns used along the north and south wings.

The basement is ashlared and pierced by almost square windows arranged in pairs. The main story is rusticated, with single tall windows, square-topped except in the projecting parts of the wings, where the heads are rounded. Above the windows of

"The Emigrant Wagon," one of the picture panels in the tiled pavement.

the connecting wings are transoms over which are hood mouldings alternately triangular and curved. Above these, again, are circular lights or round attic windows enclosed in a square frame of three parallel flat borders. The treatment at this point is strongly reminiscent of the Italian Renaissance of the sixteenth century.

The north, central and south wings have the string course of moulding broken, by the insertion of balustrades, into four plinths upon which rest the columns, in pairs, supporting the portico above. The pilasters behind each column have in their capitals the anthemion ornament, the design carved by the Greeks so frequently on the cymatium that edged the corona. The entablature runs around the whole building and is surmounted by a parapet of alternating piers and balustrades. Over the projection of the principal wings, the pierced parapet is replaced by solid ones, the central wing showing an attic, while the side wings have the attic concealed by pediments. In the tympanums of these latter are sculptured decorations.

The great dome continues the Corinthian motif in the 16 piers around the drum and in the 16 piers of columns in the cupola. The structure terminates in a truncated spire supporting a gilt ball upon which is a gilded bronze statue symbolic of the Commonwealth.

The main entrance is flanked by the impressive Barnard groups of statuary, heroic in size and carved out of white marble. To the south is the "Burden of Life"; to the north, the "Labor and Brotherhood." These groups were finished in 1910 and were for some months on exhibition at the Salon in

Sculptured ornament over Entresol Door on east side of the rotunda.

Paris before being put in place in the Capitol.

Passing through the superb bronze doors that remind one of the famous Ghiberti doors for the Baptistery at Florence, a vestibule is disclosed having rooms on either side for the convenience of deputations waiting on the Governor or General Assembly. The doorways, as well as the high wainscotings, are of white marble from Vermont, a material that is used in large quantities throughout this floor and up through the decoration of the hall as far as the heads of the shafts of the pilasters.

Behind the sculptured groups over the vestibule doors the wall of the lunette is overlaid with gold glass mosaic; the vaulting of the ceiling, on the other hand, is covered with a mosaic of marble of a pearl gray body with a border of blue gray laurel leaves studded with dull red berries, and having an outer edging of old rose. The method of applying this marble mosaic to the concave surfaces is interesting. A full-size drawing, in colors, of the space to be filled was covered with thin glue. Upon this the proper marble cubes were laid, right side down, and pressed onto the paper, so that they adhered. The paper was then cut into convenient pieces, for ease in handling. These were then laid in place in the ceiling, which had in the meantime received a coat of quick-setting cement. After being held in position for a while, this cement hardened, and the mosaic became fixed firmly in place. When the cement was completely dry, the paper was washed off and

South Corridor on the first floor.

the marble surface was ground to a proper finish.

Passing through the vestibule, one finds himself in a corridor with a barrel-vaulted ceiling and a tile pavement of most unusual character. It stretches away from one on all sides, covering the floor space throughout the rotunda and the principal corridors of this floor. Its dominant dull red color and uneven surface contrast strangely with the gleaming whiteness of the marble walls and pillars and the grand staircase that appears directly ahead.

Entrance to Lieutenant-Governor's Suite.

The pavement is made of upwards of 400 plaques or mosaics of colored burned clay, set irregularly and without borderings against a background of small hand-made and widely jointed red tiles. Each mosaic expresses, through the medium of pictured objects, conditions of life in the State at different periods.

Crossing the corridor, the vast height of the rotunda at once catches the eye. The visitor is first impressed by the immensity of the general dimensions. "He may be conscious," wrote Charles H. Coffin, "of the ponderous mass of supporting columns, of a generous sweep of stairway, next of broad pilasters standing proudly strong; of a circular crown of ornament set upon their heads; finally of a vista mounting upwards, offering here and there a vantage point of gallery for human tread; then soaring higher and yet higher, birdlike with over-arching wings, until the eye only can follow its ascent and the sight loses itself in ultimate vault of star besprinkled blue. Or of none of these things may he be conscious, filled only and lifted out of himself by the majesty of supporting massiveness and the glorious stimulus to the imagination of structural ascension. Of the first impression may be one not of form, but of color. He is conscious of the shimmer of white marble, as it mingles its passages of resplendent purity and the infinite mystery of shadowed grays; of recurrent masses of lustrous and bronze; and, higher up, of bands of brilliant blue and gold, and yet higher, of a softened radiance of delicately blended hues, swimming into fainter and fainter distance—the whole a structure of light and color."

The rotunda is rectangular in plan—a square with its four corners built up with masonry to form the piers upon which the

Balcony on the second floor, in the rotunda, showing the extensive use of marble in the Pennsylvania State Capitol.

weight of the dome rests. Ascending from near the center of the first floor rises the Grand Staircase, easily the outstanding feature of the lower portion of the general scheme. The order of architecture used is the simple Greek Doric, which changes in the upper portions to the Corinthian, with its more elaborate ornamentation.

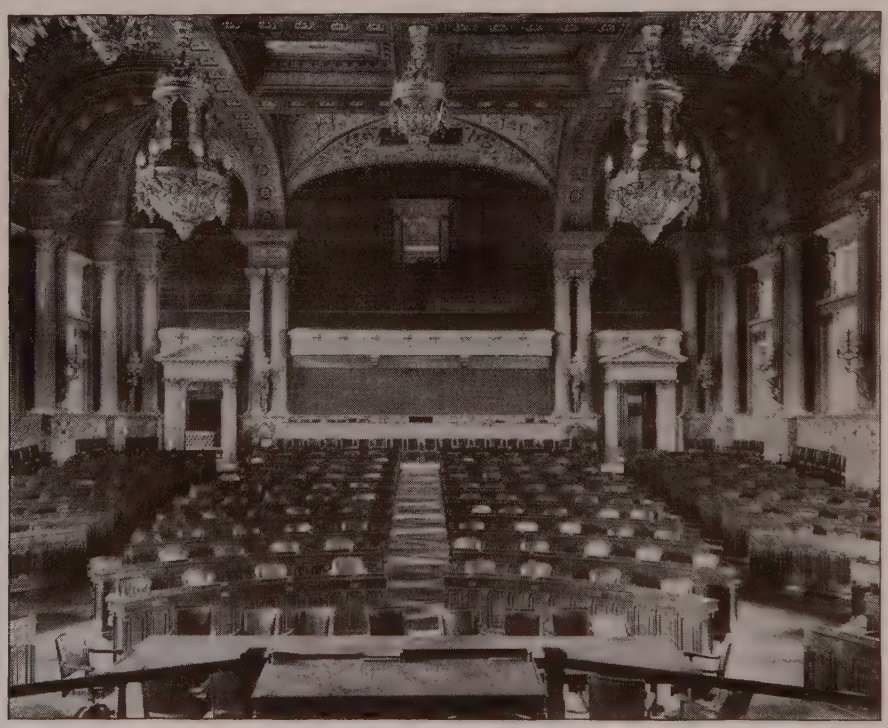
Extending north and south from the rotunda, connecting the extreme wings, are corridors wainscoted with marble and divided into bays by pilasters. The vaultings of the ceiling form lunettes, seven to each side of each corridor, and these are filled with mural paintings. Opening off the corridors are doors leading to various rooms, each with its own color scheme and architectural treatment. Of these, the Treasury Department is perhaps the most interesting, with its marble counters and pillars of the same material, and its general suggestion of the Egyptian style.

Returning to the rotunda, we notice that above the ground floor are three tiers of encircling galleries indicated from below by screens of decorative architecture which extend three-fourths of the way around the circumference of the rotunda. The east side is taken up by the Grand Staircase and its background.

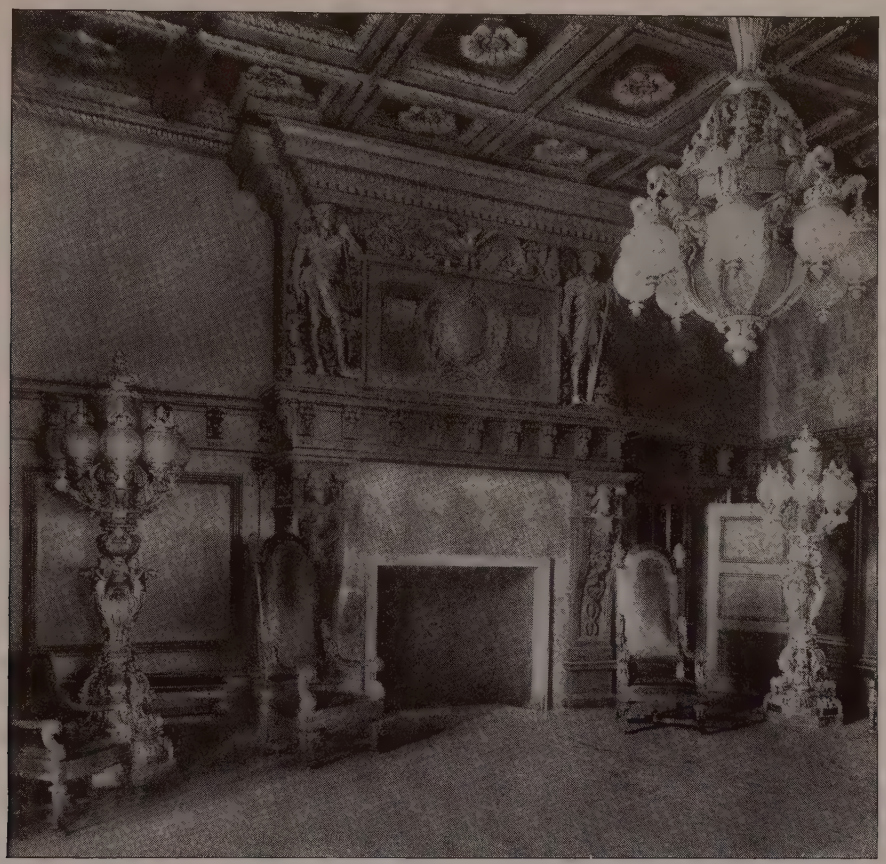
The main floor is rendered impressive by 12 Doric columns, 3 at each side of the north and south openings to the wings. These are of Vermont marble, as is the wainscoting of the rotunda up to the top of the large piers that support the base of the drum. The

Grand Staircase rises by 13 steps to a landing from where it ascends by 12 more steps to the entresol level. Here it divides and continues upward on either side to the balcony level. The bottom of the stairs spreads out fanwise, the newel posts being formed of heavy, round pedestals with carved marble statues of draped angels holding aloft large light globes. The balusters curve gracefully upward, showing off the Vermont marble to advantage. The treads are of white Italian marble, with a veining of gray. The entrance to the entresol is through a doorway between two carved marble Caryatids supporting an entablature of the same material, above which is a globe flanked by baby figures, and on which is perched an eagle. Behind this doorway rise lofty openings terminating at the top in arches. Three horizontal bands of marble mark the gallery levels. The lowest openings are faced with marble balustrades; the upper with grilles of modeled bronze. The three other sides of the square have only one balcony tier, with the space beneath the latter in the west bay open, affording a sort of vestibule to the suite of the Lieutenant-Governor. The right hand room is the private office of the Lieutenant-Governor, with its splendid green mantel of Connemara marble from Ireland. Next to this room is the Reception Room, also with its mantel that strikes the color note of the decorative scheme. This mantel is of Numidian marble from Africa, of a rich red tone. The third room, the Ladies' Parlor, is distinguished by a table with a marble top of dark gray Grecian marble. The mantel here is of green Grecian marble and is reputed to have come from a castle in Rome several centuries old.

Continuing around the gallery, with its floor of Italian gray marble, we enter on the north the Senate Chamber, a large room



The House of Representatives, in the south wing. The marble used here is from the French Pyrenees.



The striking Siena marble mantel in the Reception Room of the Governor on the second floor.

95 feet wide and 80 feet long, abounding in color and elegance of decoration. The most striking feature is the wainscot of Irish green Connemara marble. The material is full of life and color, due to the veinings that run through the successive slabs in beautiful, continuous, wavelike patterns, but always with a predominating green hue. This green color furnishes the color note of the room; it is enriched in the upper portions of the chamber by the introduction of gold, especially in the bronze work of the balconies. The architect has drawn his inspiration for the treatment from the choir galleries of St. John Lateran in Rome, even reproducing some of the details of the embossing and gilding that may be found in that famous edifice. The stained glass windows by Van Ingen and the paintings by Miss Violet Oakley add largely to the final ensemble of color.

On the opposite side of the rotunda is the House of Representatives, somewhat larger than the Senate, and considerably more ornate, though none the less beautiful. The prevailing color scheme is a contrast of deep blue with tints of cream, light brown and gold. Here, too, the design is dependent upon a foundation of marble, in this case a wainscoting of Pyrenean, a French stone of a buff background showing a variety of delicate blurrings of rose, violet, purple and gray. This wainscot is 6 feet high at the rear of the room but deepens to 9 feet 4 inches in the pit. Rising above this broad band of colorful material is a series of fluted Corinthian columns, with gilded capitals. The architrave bands are a creamy buff,

and the frieze shows embossing and gilding upon a ground of blue. The ceiling, supported upon arched ribs, is divided by richly colored beams into a geometric arrangement of coffered spaces, except for a large center circle. These spaces are colored a rich blue and overlaid with gilded Renaissance ornament. The candelabra which suspend from the intersection of the ceiling beams are unusually claborate in design and worthy of special remark. Here, too, are stained glass windows by Van Ingen and the famous Edwin A. Abbey paintings, the largest and most important of which is the "Apotheosis of Pennsylvania" above the speaker's rostrum.

The Governor's suite is in the south wing on the second floor. It includes the Waiting Room, the Secretary's Office and the Governor's Room, all of them treated in the English Renaissance manner. The largest of these, the Waiting Room, is distinguished by a sumptuousness unequalled elsewhere in the building. Conspicuous figures are the imposing mantels, one at each end of the room, of Convent Siena marble. In the Governor's Room the mantel is of dark red Numidian marble, its richness increased by contrast between its polished surface and that of the two pairs of Caryatids that flank the fireplace. These latter surfaces are left unpolished, just as they came from the sculptor's chisel.

All the upper corridors in the lateral extensions of the main building as well as in the wings have floors of marble terrazzo with a border of white Vermont marble. The walls are wainscoted 6 feet high with the latter material. The side stairs are of iron with white Italian marble treads.

One of the groups of marble statuary in the corridors and rotunda of the Pennsylvania State Capitol at Harrisburg.

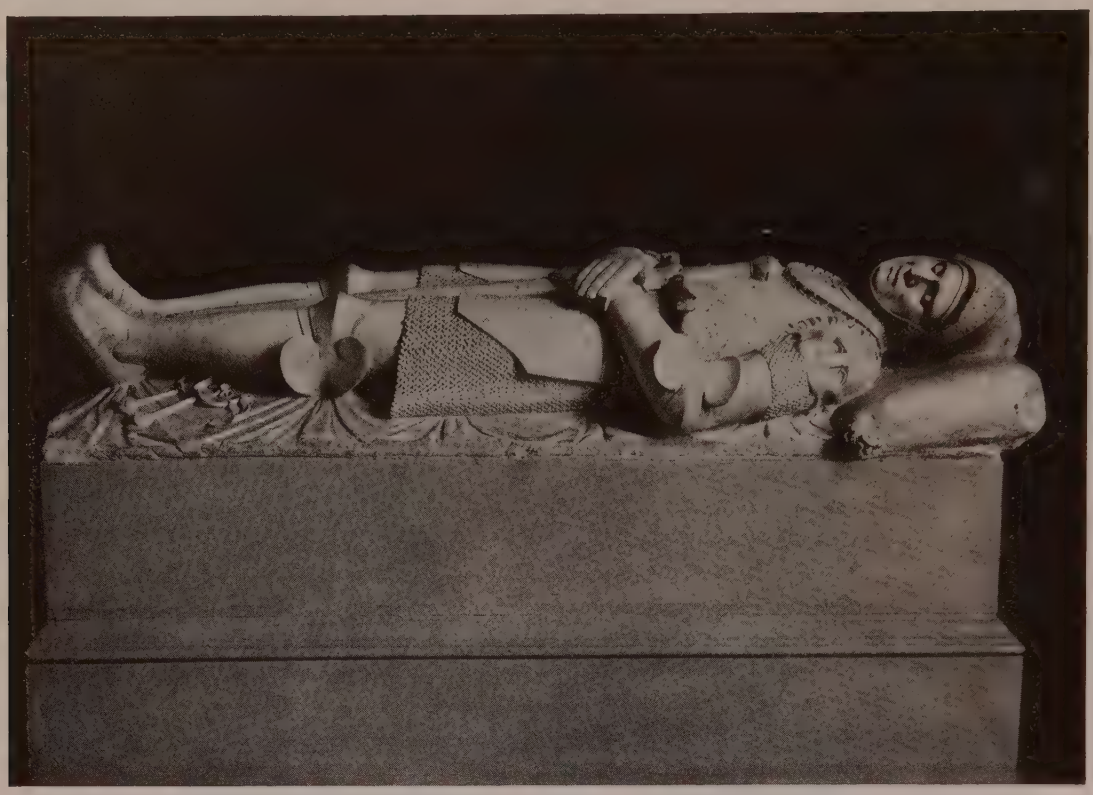
Marble tomb of the Doge Andrea Vendramin in Venice by Allessandro Leopardi.

SCULPTURE OF THE DEVELOPED RENAISSANCE IN ITALY

BYZANTINE sculpture may be characterized as symbolic. Italian sculpture of the early Renaissance as exemplified by Pisano, replaced these symbolic representations by actual imitations of forms, chosen from the antique. Giovanni led the way to the study of the living model. However, the admiration of ancient art, which was known almost exclusively through Roman works or Roman copies of Greek originals, continued unabated. The result was an action and a reaction of the two influences upon each other which stimulated intelligent and correct representation.

Freeman recognized this fact and expressed it in the following words: "It is by reason of his clever amalgamation of the facts of classic proportion and method with the facts accumulated by the study of nature, that the sculpture of the early sixteenth century differs so widely from that of the fifteenth, and that nudes, such, for

Illustrations courtesy of Mr. Thomas Machen, architect, Baltimore, Md.



Marble effigy of Guidarello Guidarelli in the Institute of Belles Arts at Ravenna; probably by Tullio Lombardo.

instance, as Donatello's David and Giovanni da Bologna's Mercury, could never change places with each other chronologically. Having mastered both nature's laws of structure and action, and the classic laws of proportion and pose, those masters of the late Renaissance before Michelangelo and those later men who are unswerved by his influence show themselves desirous and able to create figures which unite with the living quality of forms imitated from the individual the harmony of proportion found in the scale of parts adopted from the classic. Had the genius of Michelangelo not upburst into sculpture, there might have been from this point a gradual development of a type wholly national, but in Michelangelo are achieved the results of generations of ordinary striving."

The sixteenth century saw, besides the completion of the formulative period of Renaissance sculpture, the establishment of the methods of decoration, the mastery of technical processes, and the emancipation of sculpture from both painting and architecture. "Architecture now became more sculpturesque. Columns were substituted for pilasters, cornices and mouldings received greater projection, allowing a new play of light and shade." (Marquand and Frothingham: A History of Sculpture.) Buildings became merely backgrounds for sculptured figures. A tendency to imitation of well-established rules became apparent quite early. The decorative low relief gave way to alto relievo. The statue became the most important thing. There was evident a careful modeling, a correctness in arrangement of pose and drapery, with a corresponding loss of strength in the concept

Monument to Giovanni Antonio Gattamelata in the Church del Santo at Padua.

Statue of Mercury, by Sansovino, on the Loggietta, in Venice.

and design—a most natural denouement.

Among the sculptors who lived and worked during the period that marked the end of the Early Renaissance and the beginning of the Developed Renaissance, were two whose works are worthy of mention as expressing most characteristically the transitionary style and methods. The first of these was Allessandro Leopardi, the Venetian. He collaborated with the Lombardi in executing that most imposing of the Ducal Tombs, that of Andrea Vendramin in SS. Giovanni e Paolo, which was completed in 1494. He drew the design and did the carved ornamental work; Tullio Lombardo probably did the statues. The great central arch and the Corinthian columns flanked by wings with flat pilasters are finely proportioned and in splendid harmony. The whole composition is graceful and yet dignified; the effigies surrounded by figures bearing torches, the two youthful warriors in the niches of the wings, the Virtue on the arca itself, and the emblems of Pagan and Christian objects, all together are of an irresistible grace. Even Ruskin, with his astonishing aversion to all Renaissance ornamentation, wrote of this tomb: "Its sculpture is perfect in workmanship, and devoid of thought, its dragons are covered with marvellous scales, but have no terror and sting in them; its birds are perfect in plumage, but have no song in them; its children are lovely in limb, but have no childishness in them."

Leopardi directed the founding and erection of a fine Colleone statue, and designed the pedestal for Verrocchio's masterpiece. He claimed credit for the whole statue and for a time his claim was allowed. Later a document, signed by Lorenzo di Credi, came to light which proved that the statue was almost completed in the clay at Verrocchio's death.

The second of the sculptors referred to was Tullio Lombardo, a Venetian and one of Pietro's sons. Although a master of technique, he was deficient in intellect and his compositions just lacked the vigor that would entitle them to the highest rating. He

co-operated with Leopardi in the Vendramini tomb, and did a large part of the figure sculpture in S. Maria dei Miracoli and in S. Giobbe and the half-length figures in the Giustiniani Chapel of S. Francesco. Tullio also did two of the marble reliefs in the Capella di S. Antonio at Padua, the beautiful figure decoration of the shaft of a marble candelabrum, and the statues of Adam and Eve, formerly on the Vendramini tomb and now in the Palazzo Vendramin-Calergi; the tomb of Matteo Bellati in the Cathedral at Feltre; and, probably, the effigy of Guidarelli, at Ravenna, attributed by some to Pinacoteca.

Among the Florentine artists of this period was Andrea Sansovino (1460-1529). He studied in Florence under Pollaiuolo and afterwards in Bertoldo's Academy at S. Marco. His first work was in S. Chiara at Monte S. Savino, where he was born. This was an altar piece, and showed a sense of beauty, but the composition was faulty and the figures were wanting in character.

In 1490 Andrea went to Portugal, where he remained eight years, and after his return he did the font in the Baptistery at Volterra (1502), and the Madonna and the Baptist to finish Civitali's decoration of the chapel of the Baptist in the Cathedral at Genoa. In 1502 he contracted for the group over the east door of the Florentine Baptistery, but death overtook him before its completion. In 1506 he went to Rome where he did the tombs of the Cardinals Ascanio Sforza (1505) and Girolamo Basso (1597) in S. Maria del Popolo. These were exactly the same in architectural design and differed only slightly in detail. They show an intelligent proportion between sculpture and architectural setting, and a fine harmony in the relations of cornice, pillar, arch and horizontal line. The Mortuary effigies were ungraceful, and the heads and draperies showed the influence of Roman classic art, but the figures of Prudence and Fortitude were of great beauty and were probably Sansovino's best productions.

In 1513 he went to Loreto where he worked at the Santa Casa till his death in 1529. He

Sansovino's Mars, on the Loggietta, near the Campanile of S. Marco, Venice.

was probably the author of the whole design, though many parts were executed, after his death, by others. The Annunciation and the Nativity, the great reliefs of the south and west sides, were begun by him but finished by Bandinelli in 1531. The complete scheme of decoration at Loreto was Sansovino's most ambitious work, but it was marked with all the signs of decadence. His attempt to let sculpture do the work of painting was not successful. Though one of the most admired sculptors of the period, his treatment of the human figure was unsatisfactory. That he himself realized his shortcomings is evidenced by his efforts to endow them with superabundant vitality. Both his Nativity and his Annunciation illustrate this fact.

In the north of Italy the influence of the school of Michelangelo (of whom we shall speak more fully in our next issue) dominated the sculptural achievements of the time. Milan and Pavia boasted of no outstanding artists. Modena had its Begarelli, working mostly in terra cotta and exhibiting a thoroughly picturesque treatment. Bologna profited by the skill of Alfonso Lombardi and Il Tribolo. In Venice, however, was the talented pupil of Andrea Sansovino, Jacopo Tatti, known always in art under his master's name. He was the rival of Michelangelo both in architecture and sculpture, and the hostility between them begun at the time of the rejection of Sansovino's plan for the façade of S. Lorenzo at Florence in favor of Michelangelo's, grew more bitter with advancing years. Born in 1486, he went to Rome in 1510, where he was engaged in repairing the ancient statues. He made sketches of many of these and became imbued with the classic spirit. In 1513, he returned to Florence, where he finished the Bacchus in the National Museum, one of his most important statues and considered by many superior to that of his rival in the same place. The Bacchus is of slightly yellowed marble under life size, with a suggestion of movement that is remarkable. It was evidently inspired by the classic, if we may judge from the balance of the members and their proportions. There is also in the Bargello a bronze Tabernacle by Jacopo, with a relief of Christ, a fine example of his work at this time.

He returned about 1515 to Rome and during the next seven years completed the huge Madonna in S. Agostino, the statues of S. James in S. Maria di Monserrato, and S. Anthony of Padua, now in S. Petronio at Bologna. He left Rome for short periods after 1523, returning each time, but in 1527 he settled in Venice, where his career was largely that of an architect rather than a sculptor. In fact, he practically created Venice as we know it today. His sculptural works, though overshadowed by his building activities, are of no mean quality. His treatment of ornamental detail is fully as powerful as that of Pietro Lombardo, though his reliefs are somewhat unsatisfactory.

The façade of the Loggietta, that exquisite structure which he built in 1540, contains the four figures of Hermes, Pallas, Apollo and Peace, which enjoy a distinction for their beauty of form. On the interior are some reliefs in marble, depicting in allegorical form events in Venetian history. On the tomb of the Doge Venier in S. Salvatore is the figure of Hope, one of Sansovino's finest works; the tomb of Cardinal Podocataro in S. Sebastiano is worthy of remark, as are the seated figures of the Evangelists upon the railing of the high altar in S. Marco. His most prominent, but, in the opinion of Waters and others, his least meritorious statues are the Mars and Neptune on the Giants' Staircase of the Ducal Palace.

Mausoleum of Giovanni Galeazzo in the Certosa di Pavia, probably designed by Gian Christoforo Romano about 1492.

Sansovino's Minerva, on the Loggietta.

Gian Christoforo Romano (about 1465–1512), the son of Isaia de Pisa, was probably trained by his father and Paolo Romano. In 1491 he went to Milan, where he executed a bust of the Duchess Beatrice which is supposed to be the one now in the Louvre. He probably designed the tomb of Gian Galeazzo Visconti in the Certosa at Pavia, though some authorities are disposed to withhold from him such a distinction. It is nevertheless signed by him, and he certainly has the best claim. It is known for a fact that the effigy is his work, and perhaps the two figures on the sarcophagus.

At Cremono in 1505 he did the tomb of Paolo Francesco Trecchi in S. Vincenzo; and probably the tombs of Pietro Mellini of Albertoni and of Podocataro in S. Maria del Popolo. Many medals for people of prominence were executed by him during his brief lifetime, as well as busts and several relief portraits. He retained much of the spirit of the Early Renaissance and was personally a man of charm and distinction.

Following the style of Michelangelo was Baccio Bandinelli (1487–1559) who, says Marquand, "aimed to be more Michelangelesque than Michelangelo himself." He was far inferior to the great master, as evidenced by his Hercules and Cacus in front of the Palazzo Vecchio. His replica of Laocoön, ordered by Pope Clement VII as a gift for Charles V, is now in the Uffizi, and is a good piece of work. He designed the tombs of Leo X and Clement VII in the Minerva, having secured the commissions

by underhand dealing after the work was promised to Alessandro Lombardo. In these monuments he plagiarized from the classic triumphal arch, but probably succeeded far better in so doing than if he had endeavored to follow original lines. The High Altar of the Cathedral at Florence, and the reliefs on the circular choir enclosure, are by him. The Adam and Eve which formed part of the decoration were removed in 1722 as offensive to Christian decency. Among his other works are the Pietas in the Annunziato and in S. Croce, the Bacchus in the Pitti and several small bronzes and a bust of Cosimi I, in the Bargello.

Bartolommeo Ammanati (1511–92) was first a pupil of Bandinelli, and then of Sansovino at Venice His most important works were: the group for Tribolo's fountain at the Villa Castello; the fountain in the Piazzo della Signoria, at Florence; the huge figure in the court of the Palazza Aremberg; and the tomb of the jurisconsult Benavides in the Eremitani, at Padua.

Contemporary with the sculptors we have mentioned, there were many others of equal merit, if not of equal prominence. Such names as Cattaneo, Campagna, Montorsoli, Leoni, da Bologna, Vittoria, Ferrucci, Caradosso and Rovezzano are intimately connected with this period of Italian art. The chief figures of the time, Michelangelo and Cellini, each supreme in his field of marble and bronze, will be treated in our next issue.

Tomb of Cardinal Sforza by A. Sansovino.

A LIST OF THE WORLD'S MARBLES

By J. J. McCLYMONT

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

GROUP A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

GROUP B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

GROUP C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

GROUP D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

Marbre de Villars—Group C.
Quarried at Villars, Cote d'Or, France.
Light buff.
Takes a good polish.

Marbriere—Marble quarry.

Marenna
Quarried in Italy.
As the location of quarry is not disclosed, it is probably known by some other name.
Red with white veins and spots.

Margarethen
Name of a town in lower Austria, near which are quarried "a chalky white, buff and gray limestones suitable for building and carved work, but which do not polish." (Merrill.)

Margorre
Quarried near Margorre, Tuscany, Italy.
Bluish-white with brown veins. (Blagrove.)
Bluish white with brown veins. (Blagrove.)

Marino—See Peperino.

Marino Alabaster—Same as Alabastro Marino.

Marino Cippolino—Same as Cippolino Greek.

Marino Dorato Alabaster—Same as Alabastro Marino Dorato.

Marino Minuto—Same as Cippolino Greek.

Marino Violetto—Same as Cippolino Greek.

Mariposa
Quarried in Vermont.
Light gray, nearly white with fairly pronounced blackish markings.

Maritimes Alps or Alps Maritimes
On the border between the southeast extremity of France and Italy.
For marbles quarried from this mountain range see Marbre de Turbie and Vert Maurin.

Marl
A calcium carbonate of clay and sand.

Marled
Marbled, variegated, mottled. (Scott.)

Marmara or Marmora
Ancient Proconnesus, modern Cyzican.
Catacolon Quarries on the Island of Marmara in the Sea of Marmora.
Another variety is grayish-white with stripes of darker gray.
This quarry was operated at an early period, abandoned, and rediscovered in recent years.

Marmara Island
This island in the Sea of Marmora is composed entirely of limestone and marble.
The original name was Proconnesus, and the oft-mentioned Proconnesian was quarried at Catacolon, close to Petali Liman.
Marble is now produced from the same district known as Marmora Statuary. Rose d'Orient is another marble from the Catacolon Quarries.

Marmiere
Caldana and Brocatelle Siena are quarried near Marmiere and sometimes known as Marmiere Marble.

Marmor Alabastrum or Alabastro Antico—Ancient name for Algerian Onyx.

Marmor Arabicum — Same as Egyptian Onyx.

Marmoraja
Quarried near Marmoraja, Tuscany, Italy.
Yellow with veins and spots of darker yellow.

Marmor Batthium—Sometimes called Bianco Antico.
An ancient marble quarried in Asia Minor.
Exact location of quarry or quarries is not known, but probably at or near Ieos or in the neighborhood of Ephesus and Eritrea.
That there was a number of quarries producing varieties of this marble there seems to be no doubt.
The color is generally gray or grayish-white.

Marmor Bianco
Quarried at Kleber, Algiers, Africa.
Creamy-white. (Blagrove.)

Marmorbruket Quarries—See Ringborg Green.

Marmor Carystium—Same as Cippolino Greek.

Marmor Celticum—Same as Grand Antique from the Castelnau Quarries, France.

Marmor Chian or Marmor Chium—Same as Porta Santa.
Some writers claim this marble is the ancient Africano, but comparison of samples disproves this claim.

Marmor Cipolla—Same as the veined Hymetian.

Marmor Coraliticum—Same as one of the Palombino and Synnadic marbles.

Marmor Corinthium
An ancient marble from Corinth.
Indistinct and clouded mixture of pure white, pale brown, and lilac gray, plentifully flushed with pink on ground of yellow or pinkish-gray, with pebbles of rosy or yellowish-gray always bordered with gray or brown.

Marmor di Castellina—Same as Florentine White Alabaster.

Marmor Docimenium
Near Synnada, now called Docimium marble, known by various names. See Plombino.

Marmor Greaco Fino—Same as Pentelac.

Marmor Greco Doro
According to Bruzza this name was given to the coarser grained variety of Parian marble.

Marmor Greco Fetido
Name used by Roman stone cutters for a variety of Hymetian marble.

Marmor Greco Giallognolo
One of the ancient marbles quarried on the Island of Thasos, in the Ægean Sea, off the coast of Thrace.
Was used by the Romans.
Quarries are not producing yellowish-white.
Another variety known as Marmor Thasium or Greco Livido is white with a bluish tinge.

Marmor Hymettian—Same as Hymetian.

Marmor Iasium—Same as Porta Santa.

Marmor Imezio—Same as Hymettian.

Marmor Jassense—Same as Porta Santa.

Marmor Lacedaemonium Veride—Same as Green Porphyry.

Marmor Lesbium
An ancient marble used by the Romans, quarried on the Island of Lesbos (Modern Metilin or Mytilene) off the coast of Mysia, north of the entrance to the Gulf of Smyrna.
Yellowish-white statuary stained with ashy black, containing large conspicuous crystals.

Marmor Ligusticum
Roman name for marbles from Liguria, Italy.
See Portor (Black and Gold).

Marmor Luculleon—See Bigio Morato.

Marmor Lunense
Ancient Roman name for Carrara marbles, but more particularly to those from the Fantiscritti Quarries.
See Lunense Antico and Lunense Macchiato.

Marmor Lychnite
Old name for Parian.

Marmor Lydium—See Rosso Brecciato.

Marmor Lygdinum
Some authorities believe this to be an alabaster found on the Island of Paros. Others that it is the same as Parian marble. Judging from its name, it probably is the same as Marmor Lydium.

Marmor Merarense—Same as Palombino Giallognolo.

Marmor Molossium
An ancient marble quarried near the source of the Archeron, Epirus, Greece.
Is said to resemble Fior di Persica, and some writers refer to this marble by the Italian name.
Perhaps some of the varieties came from the Island of Elba.
According to Pullen this marble bears a

strong resemblance to Cottanello in the disposition of markings. Although the color differs materially, his description is lilac, peach blossom, red, and white, in flowery patterns.

Marmor Numidicum
Ancient name for Numidian Red.

Marmor Parian or Parium.
Same as Parian.

Marmor Pavonazzetto
This was the name given to one of ancient Palombino marbles.

Marmor Pentelicum—Same as Pentelic.

Marmor Phengite—Same as Bianco e Giallo Antico.

Marmor Phrygium—Same as Palombino.

Marmor Porino
According to Pullen, this ancient marble, also known as Grechetto Duro, came from the neighborhood of Olympia in the Peloponnesus.
Very white and sparkling, sometimes stained with orange.
Bruzza says the Grechetto Duro was given to the finer grade of Parian marble. This conflict of opinion might lead to the conclusion that Parino is a composition of Parian and that Marmor Parino is really Parian marble.

Marmor Proconnesium
This name was given to marble from Proconnesia, modern—Marmora, an Island in the Sea of Marmora, and may have been applied to Marmora or Rose d'Orient, as both of those marbles are found on this island.

Marmor Quarries—See Queensland.

Marmor Rhodium—See Giallo e Nero Antico from the Island of Rhodes.

Marmor Rosa
Javita Quarries, near Buixcarro, Valencia, Spain.
Light pink with slender dark red markings. (Watson.)

Marmor Schiston—Same as Tortosa Brocatello.

Marmor Scyrium—Same as Skyros.

Marmor Synadicum
A marble formerly quarried near the ancient city of Synnada, in modern Docimium, Asiatic Turkey, Asia Minor, the locality of which is now Kara-Hissar. As several towns in Asiatic Turkey bear this same name, the exact location is unknown.
The marble is vaguely described as variegated of various colors of which red and purple are mentioned.
See Palombino marbles.

Marmor Taenarium—Same as Rosso Antico.

Marmor Thasium or Greco Livido.
Ancient marble, quarried at Island of Thasos, Ægean Sea.
White with a bluish tinge, compact texture and sparkling crystals.

Marmor Tirio or Marmor Tyrium.
An ancient marble from Mount Lebanon near the Ancient Tyne.
Bluish-white statuary.

Marmor Verde Augustus—Same as Green Porphyry of Egypt.

I heard the trailing garments of the Night
Sweep through her marble halls.

—Longfellow

Imperishable Beauty

MME. de Krudener once said: "Beauty is only truly irresistible when it shows us something less transitory than itself."

Naturally the architect who builds for permanence gives first consideration to marble when choosing his medium.

A HANDBOOK OF MARBLE

It is the purpose of the National Association of Marble Dealers, to publish as soon as possible, a handbook on marble. The material contained in this book will be contributed by those best qualified to speak in an authoritative manner on the various matters treated. This is the thirteenth installment and contains part of the fourth chapter, written by John Stephen Sewell, President of the Alabama Marble Company. These extracts will probably undergo some slight changes before appearing later in book form.

CHAPTER IV—Finishing Marble (*Continued*)

SOMETIMES a "green putty powder," made by burning a mixture of sulphur and bichromate of potassium is used in polishing marble; and, on some kinds of Verde Antique marble, emery flour is used by some manufacturers. The practice is not entirely uniform and each shop foreman is likely to have his own favorite formula for each kind of marble. But the final result is the same in all high-grade shops.

Where large numbers of large slabs are being finished, it pays to have a special buffing machine, somewhat larger and heavier than an ordinary gritting machine. The operation of buffing can be considerably accelerated by this means, and one buffing machine can finish all the slabs that can be gritted and honed by from three to five ordinary machines. In one large shop in the South, such a machine, running on large slabs alone, has buffed as much as 2,600 square feet in ten hours. But this was due to a highly skilled workman's desire to prove what he could do, for the benefit of a sceptical visitor, and it is only fair to say that the man's employers would have been unwilling for him to maintain such a pace, day in and day out. However, there was no difficulty, when conditions were fairly good, in maintaining a daily average of from 1,800 to 2,000 square feet.

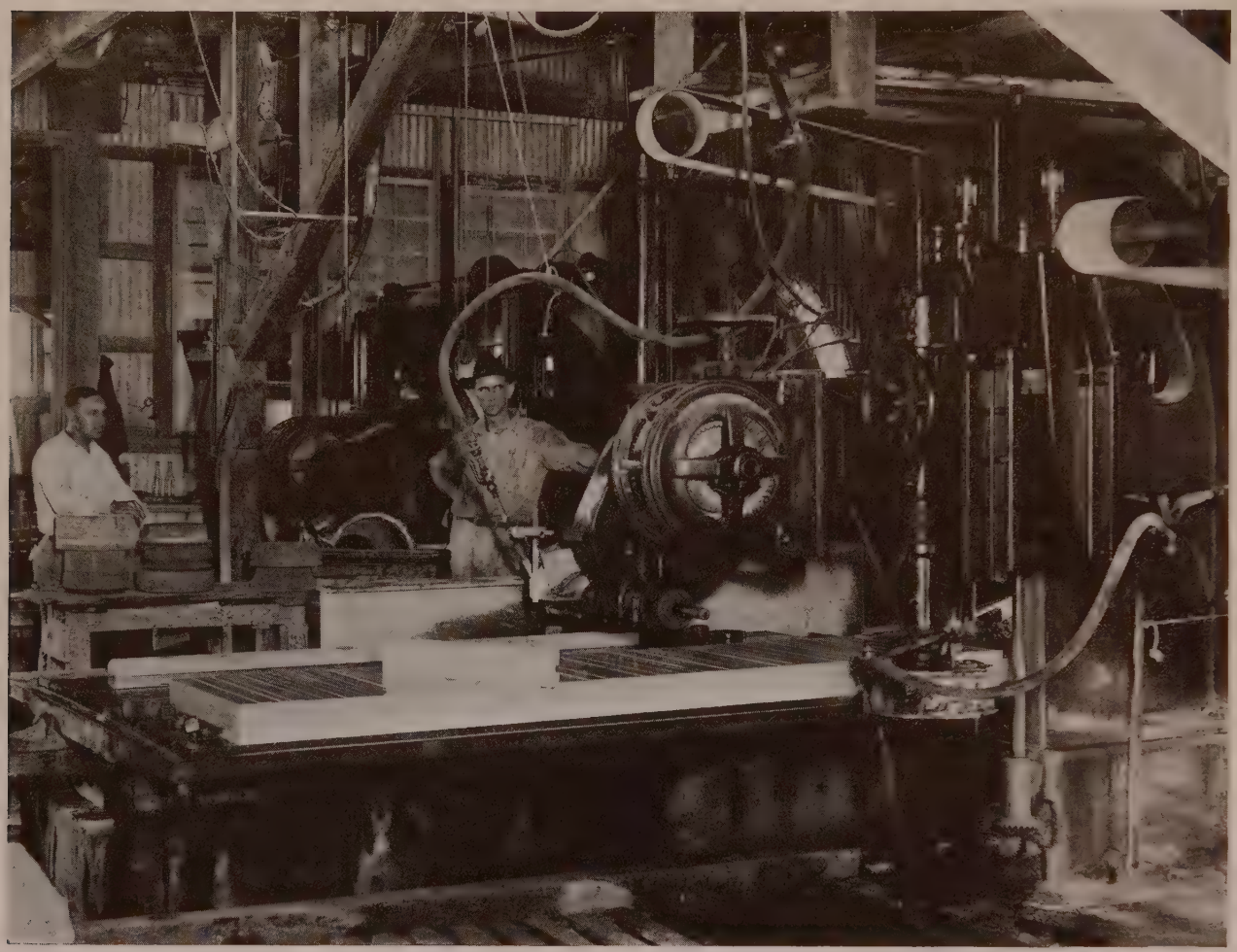
A gritting machine may, under extremely favorable conditions, grit and hone as much as 500 square feet in ten hours. This is high; 250 square feet under average conditions is fair. An average of 300 square feet under any and all conditions is good.

It is manifestly impracticable to grit, hone and polish the edges of thin slabs on the machines above described. This work is still often done by hand. When the edges are straight and not bevelled, they are sometimes gritted, honed and polished on small machines similar to rubbing-beds, armed with the proper kinds of grit or felt, as the case may be. But probably most of the finished edges are still finished by hand, and when the edges are bevelled or curved, there is no other practicable method. A job of average size may contain a mile or more of polished edges, depending upon the design. So the finishing of edges is often a very appreciable item of cost.

All of the above figures apply only to marbles that are sound. When slabs must be stuck together, waxed, patched and mounted on liners, all finishing operations are slowed down, and output from a given equipment is very appreciably reduced.

STICKING, PATCHING AND WAXING

There are marbles which are of wonderful beauty, but which cannot be obtained in blocks that are free of cracks or unsoundness. When the nature of the marble is such that it is possible to fill the cracks so as to closely resemble either the ground-mass or the natural veins that occur in the material, these marbles are used. Where slabs are simply intersected by natural breaks, the



The machine in the foreground is cutting a rebate in a long piece of marble, at the sane time returning the rebate across the ends of a number of pieces. The vertical shaft carrying the wheel that is cutting the returns may be seen, as well as the head where the wheel revolves on a horizontal shaft.

broken edges are heated and stuck together with melted shellac—sometimes with the addition of brass dowels. The shellac is then raked out to a slight distance below the finished surface, and this part of the crack is filled with wax, colored to imitate the ground-mass of the marble or some of its characteristic veins, depending upon which gives the better result. Sometimes the coloring matter is obtained by pulverizing a small amount of the marble itself. The "wax" used for this purpose is usually a mixture of zinc white, white shellac and a suitable pigment. The gum shellac, used as a cement in "sticking" unsound marbles, has a surprising strength. Often the shellac alone is strong enough to permit the slab, as a whole, to be handled almost as though it had been sound.

It sometimes happens that there are small pockets in the marble due to crumbly and non-consolidated material. These holes are filled up, sometimes with a small piece of marble set in, sometimes entirely with properly colored wax.

Very often it is necessary to "back-up" unsound slabs with sound slabs or strips of other material—usually fastened to the

backs of the unsound slabs with plaster of Paris or cement. Slabs or strips used in this way are known in the trade as "liners."

When the ground mass of a marble is appreciably translucent, it cannot be successfully imitated with wax nor with any other known filling material, for all of these are opaque. In such cases, if the marble is characterized by strongly marked natural veins, a crack may be filled and finished to imitate one of these. Otherwise a satisfactory job is not possible. Because of the translucence of most interior white marbles, these cannot be successfully waxed and patched, and these marbles, to be merchantable, must be sound. In the ordinary grades of White Italian marble—which, as a rule, are the least translucent of interior white marbles—there are sometimes small "sand holes." These can be filled with wax colored to imitate the gray clouding common in these marbles with fairly good results. This is the only case in which "waxing" or "patching" is acceptable in the case of white marble.

The standard has also been set for the domestic monotone marbles—such as the Tennessee marbles and those from Southwestern Missouri—that they must be sound. This is probably due to the fact that they are obtainable in this condition, without undue expense—not because they might not be patched or waxed with a fair degree of success if it were necessary.

The imported monotones, such as Tavernelle and Botticino, apparently cannot be obtained in any great quantity in sound blocks, so with them waxing and patching are permissible and necessary. These marbles are more opaque than the domestic monotones, and a skillful mechanic can wax and patch them so well that he himself will sometimes have difficulty in pointing out the cracks and patches after the slab has left his hands.

Many owners and some architects, in ignorance of the limitations as to soundness of many of the marbles used primarily for their beauty of color, insist upon having their jobs free of waxing and patching—*i.e.*, entirely sound. In rare cases this might be physically possible, given unlimited time and money; but it is wholly impracticable. If it were possible with any reasonable expenditures of time and money to get enough of these marbles in the form of sound blocks, it would require no urging from owners and architects to bring it about.

The cost of finishing a job from the unsound marbles is so variable and so great, that the trade will not handle unsound blocks of any marble of which an adequate supply of sound blocks can in any way be obtained.

Occasionally, in his zeal for just the effect he has in mind, an architect will demand other things that are quite impracticable. All marbles have been subjected to severe stresses; often a long continued stress, not sufficient to crack the marble, will be relieved by a slow recrystallization, generally localized along more or less definite lines. In marbles that are deeply and richly colored, this process often results in the expulsion of all coloring matter from the recrystallized material, and a white vein is the result. Such white veins are characteristic of certain decorative marbles, but they seem to be offensive to the tastes of some architects, who have been known to demand that the slabs be broken *along these veins*, then stuck and waxed so as to present the appearance they would have had had no white veins been present.

The veins are often wavy, almost never perfectly straight, and the material in them is often stronger than the adjacent material. Breaking the slabs in the veins would be an extremely uncertain operation. It would

be less expensive and more certain to dig out a little of the white material with an air tool, then wax the channel so produced, but it would be very difficult to make a satisfactory job by either method, and it would be very expensive.

When it comes to nature's distribution of color in a decorative marble, man is justified in making the best possible use of it, as it is, to realize his own ideals. But if he tries to change the scheme without spoiling it, he is attempting something which is in the same class as squaring the circle or duplicating the cube; it lies beyond his powers.

At the best, sawing and finishing the unsound marbles is very expensive. As compared with the sound marbles, such as Alabama or Tennessee, the sawing will average at least one-third more, with occasional cases where it will be at least three times as great. The subsequent processes may easily be three times as expensive as in the case of the sound marbles, without making any charge whatever for the reduced output from a given equipment, which is often the most serious item of all in its adverse effect on earnings.

All this is not intended as an argument against the use of these marbles; it is only intended to show the difficulties that must be overcome in their use. Their beauty would justify an expense even greater than that actually entailed; each one of them, in its own class, is without a peer. For the best of its kind, where the best is justified, expense should be a secondary consideration; but marble might be much more expensive than it is, and still give the greatest possible return on the investment.

CUBIC STOCK

In the interior marble trade, this designation applies to material that requires pieces sawed and coped to size, with their minimum dimensions greater than 2 inches. Sometimes, as in heavy ashlar, in rectangular plinths for columns, and pilasters, etc., the finished pieces are perfectly plain, without any moulding, carving, cutting or rounded edges. In such cases, the operations of rubbing, gritting and polishing do not differ from the same operations on thin stock.

If the finished surfaces are large enough, they are finished in the machines; otherwise by hand.

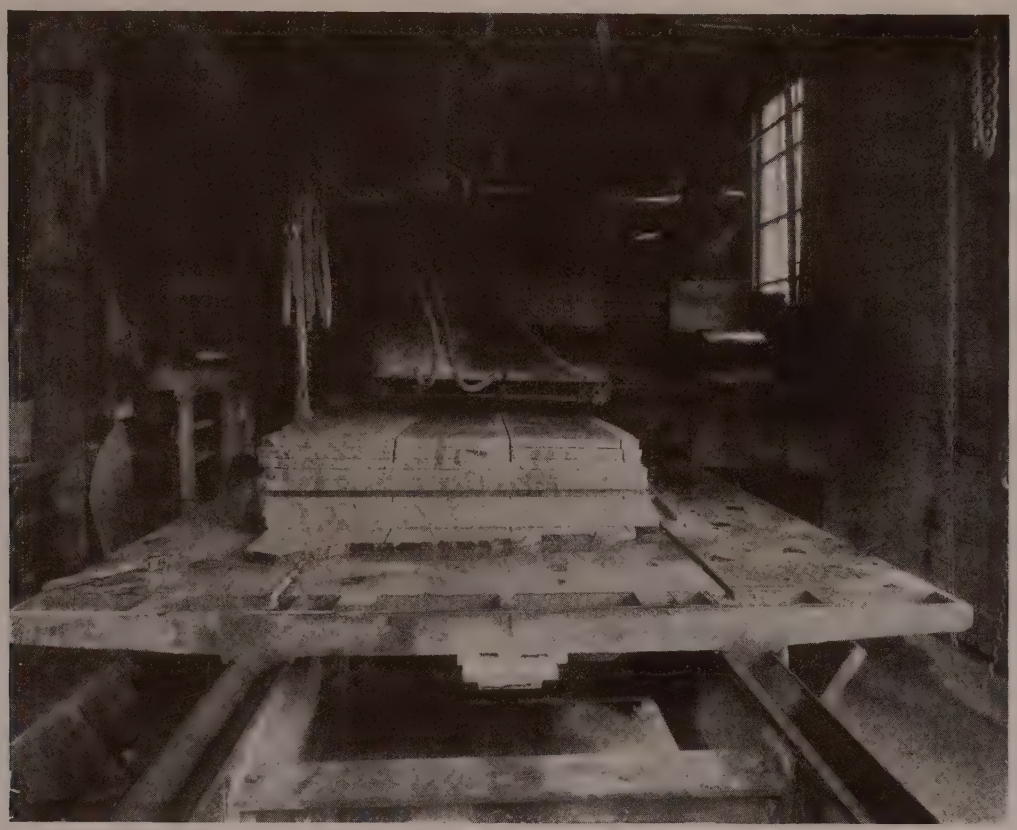
The greater portion of the cubic stock in interior work, however, is either cut (or turned), molded or carved. Even heavy stair treads, table tops (as for check-desks), seats, etc., have molded edges or at least have their corners rounded to a considerable radius.

Marble can be turned in a lathe or worked in a planer, with steel tools; planers can have so-called "circular attachments" which will enable the tool to cut the work to circular or even spherical shape (as for the voussoirs of a spherical dome). Lathes can be equipped with entasis bars, which control the distance of the tool from the axis of revolution, so that a column shaft can be turned with any desired entasis.

A lathe could be equipped with a dummy tool following a model and controlling the cutting tool, so that a piece of marble could be turned with, say, an elliptical cross section, or any other which did not involve too great complexities of shape. There are machines which will do all but the finishing work in reproducing statues, etc.

If a sufficient number or amount of each pattern of carved work were required every time, no doubt much more of it would be done by machinery. But as it is, the number of skilled carvers and cutters required is still very great and is not likely to diminish.

As a matter of fact, carborundum wheels are rapidly taking the place of steel tools in



A carborundum machine being used to rip a lot of Travertine slabs. A big machine of this type can rip a full-size slab into strips all at one time.

working marble. They do not "pluck" the material, and they leave the surface much more nearly finished than any steel tool.

A machine similar to a planer but equipped for using carborundum wheels instead of steel tools is called, generally, a carborundum machine. They are of as many different types as planers, and of almost as many sizes. Some are specially adapted for coping, and are called coping machines. A carborundum machine of reasonable size and of the planer type should always be equipped to use wheels revolving about a vertical axis in addition to the regular equipment for wheels revolving in a horizontal axis; the object of the wheels on a vertical axis being to cut returns of moldings across the ends of pieces too long to be set up on end and run under the regular wheels.

When marble is worked in a planer or lathe with a steel tool, the wasted material is practically sheared off in flakes that are relatively large or small, depending upon the "bite" of the tool. With cranky materials this always introduces the danger of "plucking" below the finished surface to which the tool is working. This danger exists in any kind of marble if the "bite" of the tool is too deep. This makes it necessary to take a more and more shallow "bite" as the finished surface is approached. The final operation with steel consists in scraping off a very thin layer with a tool of the proper shape to fit the final surface. The steel tool

leaves the surface even rougher than a sawed face as it comes from the gangs; it must be sand-rubbed, gritted, and (usually) polished. If it is a piece of turned work, this can be accomplished by speeding up the lathe and holding pieces of the necessary finishing materials against the surface as it revolves. If it is a case of a molding from a planer, or of carved work, the whole series of operations must be carried on by hand, which is quite expensive.

The surplus material removed by a carborundum wheel is, of course, ground to an impalpable powder and carried off as slush by the water used to keep the work and the wheel cool and clean. There are certain limits within which the mere removal of surplus material can be accomplished more rapidly on a machine with a given power limit, by a steel tool, than by a carborundum wheel. But the smaller chance of breakage and plucking—the fact that the wheel can cut returns across the end of a slender piece of marble and the steel tool cannot — and the fact that the wheel usually leaves a surface which is, to all intents and purposes, more than half-gritted—all these give to the use of carborundum a great advantage.

It has the advantage in every way; to begin with, if the amount of material to be removed is small, or if the maximum depth to which it is to be removed is small. Where much material must be removed, and where the depth of removal is great, there are ways and means of counterbalancing the advantages of the steel tool. Thus, if a large column or drum is to be turned, it can first be sawed to octagon shape in the gangs or by the diamond saw. In deep moldings a strip may often be sawed out by thin carborundum wheels without encroaching on the final finished profile; or any considerable body of material to be wasted may be cut into with thin carborundum wheels to within a short distance of the finished profile, the cuts being about an inch apart. The greater part of the surplus material may then be quickly knocked off with a hammer, thus greatly reducing the amount to be ground away. If the mass to be removed is free on two intersecting faces, it is quite simple to saw it out as a whole, and if the material is expensive and the strip sawed out of a size that can be used, there may be a profit in removing it in this way. If it is free only on one face, it is simpler to saw it into strips and break it out. But even in this case it may be taken out bodily by a wire saw starting at the bottom of a carborundum cut on one side and cutting towards a similar one on the other side. Sometimes it pays to saw a strip of stock in this way, sometimes it does not. But if, as sometimes happens, a strip or two of the size that can be removed is badly needed to avoid sawing —or perhaps buying—another block to finish the job, a very great deal of trouble and expense is justified.

By taking advantage of every device for quickly removing any considerable masses of surplus material without reducing them to powder, the only advantage of the steel tool over carborundum has been so reduced that in interior work, at any rate, the tool is very nearly obsolete. The rate at which carborundum wheels grind away surplus marble is very variable in practice. On any given machine there is a limit set by the power with which it is equipped. With thin wheels and with wheels shaped to the profile of moldings with delicate members, there is a limit set by the danger of breaking the wheels. Where a heavy rectangular cut is being made with a stout wheel, there might be a limit due to the strength of parts of the machine itself, especially its driving parts. There is sometimes a limit due to the danger of breaking the marble.

The main entrance is on the north side.

THE FREER GALLERY OF ART

A Washington, D.C., Museum Built With a Center Court After the Style of the Florentine Renaissance

THE collections installed in the Freer Gallery of Art in Washington, D.C., were brought together by the late Charles Lang Freer, of Detroit, Michigan. They represent the results of Mr. Freer's personal study and acquisition over a period of about thirty-five years, the earliest of his purchases incorporated in the collections dating from the later eighties. A farmer's boy of upstate New York, a water-boy on a railroad, to train dispatcher and finally a captain of industry, he developed into a collector who bought with rare judgment, and not by hearsay. It was not until after 1900, however, when at the age of forty-six he retired from an active business life, that Mr. Freer was able to devote the greater part of his time to the development of his collections and the ideals which lay behind them. From 1900 until the time of his death in September, 1919, he gradually eliminated from his consideration all other activities which might absorb his time and strength, in order that he might work with increasing

concentration on his endeavor to establish the beginnings of what he believed to be a most valuable field of research.

Working with the conviction that the best of the cultural objects of any civilization embodied characteristics inherent in all works of art, he acquired from the West paintings by Americans in whose works he found tendencies in sympathy with those of earlier painters in China and Japan, including Whistler, Dewing, Thayer, Tryon; and examples of the work of Brush, Hassam, Homer, Melchers, Platt, Sargent and others.

From the East he gathered paintings, potteries, sculpture in stone, in wood, in lacquer; bronzes, jades and objects of various other materials. He gathered together the collection for his own pleasure, primarily, but he decided to give it to the nation, and made an offer to this effect in 1904, during the administration of President Roosevelt, with the understanding that it should be placed under the direction of the Smithsonian Institution; and, on May 5, 1906, the formal deed of gift was executed. At the same time, Mr. Freer provided an adequate home for it in Washington, and requested that this building be used exclusively for his collection. The request did not preclude, however, the possibility of its being increased by gifts from specified people or, in the oriental field, by purchase with funds bequeathed for the purpose.

Mr. Charles A. Platt, of New York, was the architect chosen by Mr. Freer to take full charge of the construction of the building. It is in the style of the Florentine Renaissance and provides one main exhibition floor of eighteen top-lighted galleries and the Peacock Room, surrounding an open court or garden. Cortissez, in the *New York Tribune*, wrote of the structure as

"The plan is developed around a center court with an arched corridor intervening." All the marbles shown, including that in the walls and columns, is Tennessee.

follows: "Platt designed the building from within outward. Prevailing climatic conditions in Washington gave him an inspiring point of departure playing into his hands. His plans developed around a central court, with an arched corridor intervening between it and the exhibition rooms. This at once did away with the frigidity so characteristic of museums. It brought into the scheme precious elements of light, air and color. One is constantly aware of the green things in the court, the green fountain in the center that wakes a memory of the great, flat bowl on the Pincian, and the influence of a bland sky is always there. Mr. Lodge has added two or three peacocks to the picture. They delightfully enrich the warm, intimate character. The visitor must be aware of the court the moment he enters, and its friendliness remains near him. Externally, the museum has a certain severity, as befits a monumental edifice, though the arches and pilasters of the main entrance and the balustrade running around the low roof considerably slighten the effect. A similar influence is exerted, too, by the manner in which the masonry has been treated. The surface is neither too rough nor too smooth. A heavier rustication would have caused the walls to resemble those of a fortress. As they stand they have all the weight they need, but leave the façade with the grace and charm belonging to one dedicated to the arts."

The building is at 12th and B Streets, Southwest, close by the new National Museum and the old Smithsonian Institution. In color it is smoke gray. It is arranged internally on the Japanese plan of a little at a time, with reserve space for future increments and private rooms for study purposes.

From the main corridor that surrounds the central court, open the various exhibition rooms, perfectly illuminated by skylights. A satisfactory simplicity, in color, mouldings and decorations, prevails. The walls are of a gray tone that in the rooms given over to the paintings is relieved by a delicate paneling in the frieze outlined in gold. There is a tactful grouping of colors and shapes, a fine adjustment of proportion. "We remember," wrote Cortissez, "how Freer studied with Platt all questions of materials. He would have rejoiced, we fancy, in the floor. It is of particles of Belgian marble, set in a brownish cement. It is comfortable to walk on, and it makes one of the handsomest floors we ever saw."

The hundreds of objects themselves are intelligently displayed. A huge screen of the Ashikaga period enhances you by its contrasting buff against the gray background and "at either end a huge bubble of a Japanese jar echoes gray and buff to delight the eye." Langdon Warner, describing the collection, wrote: "One room has Korean blue-green bowls and jars with an occasional ivory-white from a north Korean grave. Opposite are Jap potteries, little tea jars and incense pots that lend charm to a tea ceremony. The corridor bronzes and jades give a sense of sufficient excitement for a single day. For there on the left are two huge gray jade blades, each a miracle of smooth paper thinness, and with them brown discs and geomancers' mysterious tools. The hub-like earth symbols, the maces and tablets and the rings with their trigrams remain aloof. They have Chinese names and traditional uses, but their very existence was due to magic and even a museum case cannot rob them of their quality of unknowableness. We are not sure of their purposes and our best attempts at dating are but guesses. The bronzes which, we were taught to believe, descended from the mythical ages of Chon and Shang and

miraculously defied the certain, gnawing chemistry of the earth in which they were embedded, are now more reasonably ascribed to Han—perhaps a mere two thousand years ago."

The inner court, surrounded by the arched colonnade on all sides, contains in the center a large marble fountain built entirely of a dark Tennessee marble. The colonnade itself has walls of a lighter colored Tennessee marble. This same material has been used for the graceful balcony that extends around the top of the colonnade roof, and also for the inner walls of the main building above.

The basement is provided with arrangements for taking care of such exhibits as must be kept temporarily in storage. The paintings here are hung on meshed screens of metal, and the Oriental objects are placed in huge cabinets in the study rooms. The floor of the large entrance lobby, the stairways leading to the main floor, and the basement corridors are of Tennessee marble. The study rooms are on the administrative floor and their windows make the only openings in the façades other than the entrances themselves, so that the exterior of the structure seems of less bulk than is actually the case.

The inner court, surrounded by walls of Tennessee marble, in the Freer Gallery of Art. "The visitor must be aware of the court the moment he enters, and its friendliness remains near him."

THROVGH THE AGES

VOL 3 AUGUST, 1925 NO. 4

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Details of the portico, Montreal Art Gallery

THROVGH THE AGES

A Monthly Magazine devoted to the uses of Marble – its universal adaptability, beauty, permanency and economy.

VOL. 3 AUGUST, 1925 NO. 4

THE MONTREAL ART GALLERY

A Well-Planned Canadian Structure Built of Marble From the United States

AS early as 1849, several citizens and artists of Montreal banded together for the purpose of promoting interest in art and beautiful things in general. Naturally a great deal of diffidence was encountered, and it was only through the efforts and financial support of small groups of public-spirited men that the project lived and blossomed finally in 1860 into the Art Association of Montreal.

The Association was duly incorporated and its objects were declared to be the encouragement of art, and the establishment of properly equipped schools. The Right Reverend Bishop Fulford was elected President. The institution was empowered in the customary way to acquire and sell property, and its position was definitely defined by a constitution and by-laws. Though art matters were given a considerable impetus by this organization, the cost of maintenance had to be borne by a small number of the same earnest men who, by their incentive and enterprise, had sponsored the original movement. No government aid was forthcoming; the only reward was the satisfaction contained in the knowledge that they were helping in the cultural needs of the community.

The founder of the present Art Association, Benaiah Gibbs, was one of these early philanthropists. Upon his death in 1877, it was learned that he had bequeathed to the Association a parcel of land upon which to build an Art Gallery; he had also left a sum of money and a number of oil paintings and bronzes. With this windfall as a nucleus, the Council began the building of what is known as the "Old Gallery." Private subscriptions helped swell the building fund, and the structure was opened in 1879 by the Marquise of Lorne, then Governor-General of Canada, and Her Royal Highness Princess Louise.

In 1893 an addition in Phillips Square to the Old Gallery was completed. This portion was formally opened by the Earl of Aberdeen and contained a fine picture gallery, rooms for antique and life classes and a library built entirely by private subscriptions. In 1892 John W. Tempest had given a large collection of paintings of great value, besides a bequest of money for the purpose of purchasing paintings. The completion of

The Montreal Art Gallery is built entirely of white marble from the State of Vermont. It is of classic beauty.

the new building proved a new factor in strengthening the Art School. In 1909 another magnificent collection of paintings was received from the executors of the estate of William, Agnes and John Learmont. In 1912 the New Art Gallery of Montreal was completed and officially opened in November by His Royal Highness, the Duke of Connaught.

The Museum is located on Sherbrooke Street in the heart of the residential section. The architects, Edward and W. S. Maxwell, of Montreal, planned a building with an exterior of classic character, adapted to fit the complicated requirements of a modern Art Gallery. The lighting conditions demanded the introduction of side-lighted galleries and top-lighted studios for the School of Art.

These arrangements were decided upon after considerable data had been collected in Europe by Edmund M. Wheelwright, advisor to the building committee. Having been connected with the Boston Museum of Fine Arts, he was also familiar with the conclusions reached as a result of the experimental research previous to the erection of the Boston Museum.

The exterior is of Dorset white marble, the same material used in the New York Public Library. The Sherbrooke Street façade is made doubly impressive by a large portico with four huge monolithic Ionic columns, the length from base to capital being somewhat over 31 feet. To either side of this portico are flanking wings, projecting slightly, in the center of each of which is one large window opening. Above this is a panel

of sculpture in low relief carried out by the Bromsgrove Guild of Canada under the architect's direction. "These panels," said *Construction*, "are conceived in the best spirit of the Art and represent the traditions of Greek and Roman art being explained to groups of sculptors, artists, painters, etc. The difficulty of obtaining unity in panels of such size and shape has been accomplished by the introduction of a colonnade in the background. This touch, rather Italian in inspiration, is successful in execution."

On the first floor are three galleries each with top lighting, though from the street the plain attic screens the skylights. On the Ontario Avenue side, the central wing has large windows for lighting the rooms on the ground floor; those of the first floor open into side-lighted galleries. In the Art School studios, U-bar construction has been adopted, and with success. The curved eaves permit an abundance of light when most desirable and at the same time eliminate the snow and ice difficulties so frequently encountered with the usual cornice at the intersection of the two surfaces of glass.

Entering the Sherbrooke Street side by the marble steps and the triple archway, the entrance hall is reached through small vestibules. This entrance hall is a large vaulted chamber over 60 feet in length and about 25 feet in width, extending across the greater part of the building. At the far side is a broad flight of marble steps, with ample landings, leading direct to the first floor above, while on either side of this magnificent staircase of honor are vaulted passageways leading to the large transverse ex-

Main entrance hall, showing the Botticino marble walls and the alabaster lighting standards. The floor, too, is marble.

At the head of the Staircase of Honor.

hibition hall, beyond which is a large top-lighted gallery used for lectures and exhibitions. At the top of the grand stairway is a large rest room, provided with tables, chairs, palms and also used as an exhibition gallery. This room, by means of alcoves, affords a resting place from where one can view a great part of the first floor, the staircase, entrance hall, etc.—a view that is both comprehensive and interesting. The whole of this portion of the interior is built of solid Botticino marble, the columns having solid bronze bases and capitals, while the railing of the staircase is of a bronze wrought into a rich pattern.

The combined effect of the Botticino marble walls, the marble floors, the vaulted ceilings with their graceful decorations, is enhanced by the light that comes from eight carved alabaster bowls supported on alabaster columns placed around the main entrance hall. This light is softly diffused and is most agreeable as well as effective.

To the right of the entrance hall is a large room, 30 by 62 feet, which is used as a library. On the west is a gallery of similar size for case objects. Rooms at either side of the main stairway provide ample accommodations for checking the wraps and hats of visitors.

Ascending the main staircase, there is reached a top-lighted exhibition hall 66 feet by 30 feet. This hall breaks the circuit of the picture galleries. The main gallery facing Sherbrooke Street is reached by passing around the staircase well through exhibition passages 12 feet wide, having on the well side columns of Botticino marble with bronze caps and bases and wrought-bronze handrail, and on the opposite side plain walls for exhibition purposes.

The main picture gallery is 63 feet by 33 feet, and is top lighted. Adjoining on both east and west are other large galleries. On the Ontario Avenue side are three side-lighted galleries for the exhibition of special paintings and water colors. "It is of interest to note," said *Construction*, "that one can make the circuit of the six galleries and hallways on the exhibition floor without retracing one's steps. There is, therefore, always a new note of interest in going from one gallery to another, that one misses in a less skillfully planned structure."

Adaptability

NO matter how beautiful a thing may be, unless it is of practical utility it can never be of real significance. "The useful and the beautiful," said Periander, "are never separated."

No structural material equals marble in beauty. Moreover, none surpasses it in its wide range of practical application. Its position in this respect is unique.

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THE MAYFLOWER

Washington's Largest and Latest Hostelry

By ROBERT F. BERESFORD

TIME is the great transmuter! When, in July, 1922, ground was broken and excavations begun for what is now The Mayflower, Washington's finest and handsomest hotel structure, it was discovered that between the surface and bedrock—the same strata, by the way, as that on which rests the Lincoln Memorial—there lay an ancient swamp, buried under the debris of the centuries. Interest in this discovery was heightened when there were unearthed 30 feet below ground a number of huge stump remains of prehistoric trees, some of which were more than 8 feet in diameter and of an age estimated by scientists to be at least 30,000 years. So were brought to view, in the palm of time, the structural materials of an ancient era. But they were of a day that is done. The wood, white when brought to the surface, on exposure to the air turned brown and promptly succumbed to the forces of decay. Like the age they served, these remains crumbled away into the dust of the centuries. Today on the ground of their origin there stands a great edifice of twentieth century construction—of marble and stone, of concrete and brick, materials produced by the very transmutations of that time whose inroads they are designed to resist, and in

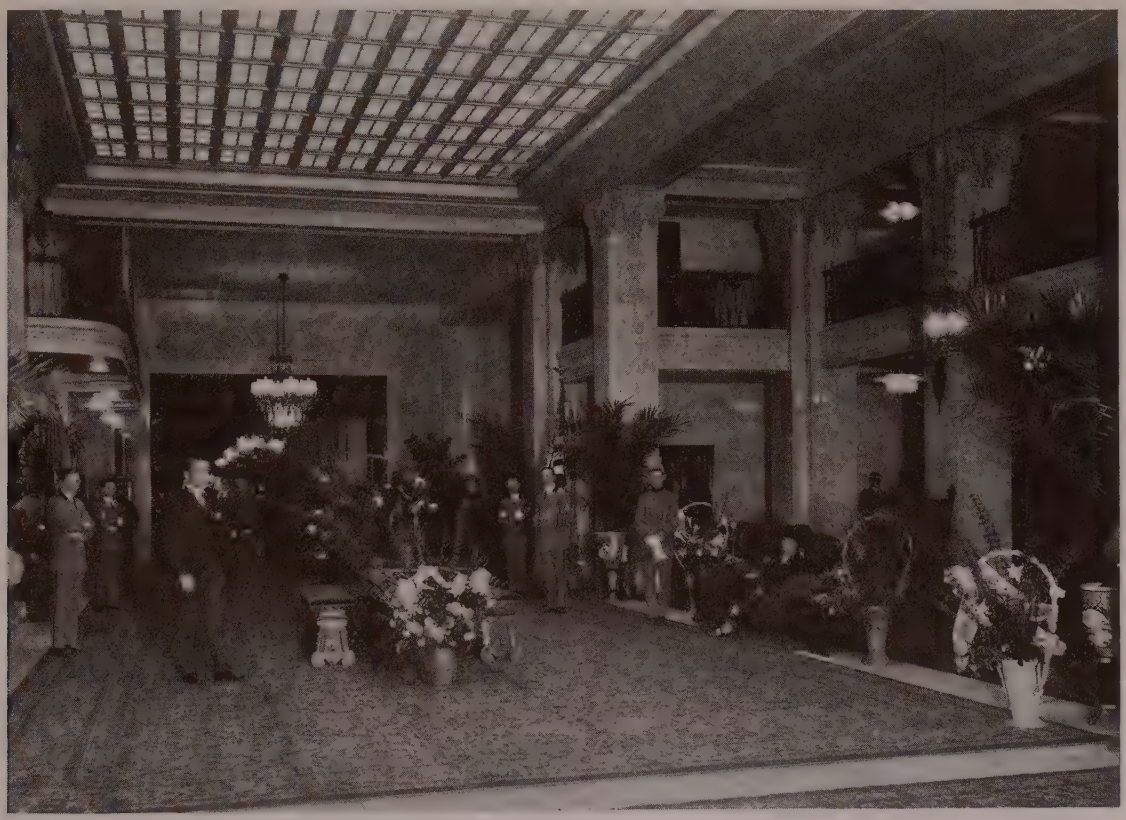
Illustrations on pages 8, 11, 14 and 15 courtesy *Architecture and Building*.

the hands of man reshaped to his varying uses.

And how varied are these uses! It was but yesterday that on this same site a circle of convent walls sheltered a garden close where laughing children trooped in and out while stately sisters strolled, reverently murmuring their prayers or telling their rosaries. Today on that acreage eleven huge stories of concrete and steel stand upreared above city thoroughfares where daily to its doors sweep an army of motor cars and a throng of people, in all the rush and turmoil of modern industrial life. Time is indeed the great transformer!

During the past ten years the population of Washington has increased from 380-000 to approximately 500,000. This increase, due to the augmented importance of the nation in international affairs and of the Nation's Capital in domestic affairs, the constant flow of foreign representatives and visitors, and among our own countrymen the growing habit of travel to the nation's shrine, has been accompanied by a marked expansion in the business area of the city. With these inevitable changes Connecticut Avenue, formerly the fashionable residential street of the Capital, has become a business thoroughfare of high-class shops and has acquired the title, "The Fifth Avenue of Washington."

Here, of a magnitude demanded by the city's growth, is situated The Mayflower, between Seventeenth and De Sales Streets, midway between the White House and Dupont Circle, in the heart of the new business zone and adjacent to the exclusive downtown residential section. Occupying a ground area of 66,000 square feet The May-



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Lobby of the Hotel Mayflower.

flower has a frontage of 187 feet on Connecticut Avenue, 456 feet on De Sales Street and 140 on Seventeenth Street. The perimeter of the building measures nearly a quarter of a mile. On its Connecticut Avenue frontage the structure is eleven stories high, the height of the remainder of the building, governed by the city's zoning restrictions, being nine stories. Due to the presence of the ancient swamp already mentioned it became necessary to set the foundations of the building on bedrock in a "tub" of concrete 40 feet high, 13 feet thick at the base, and covering an area of about one and a half acres. In this the structure rests upon 286 columns imposed upon a foundation containing 95,000,000 pounds of concrete. In size the building is computed to equal 400 ordinary six-room city dwellings. The Mayflower represents an investment of $11,000,000, including the land value and equipment. It contains more than a thousand guest rooms and residential suites; an entire addition devoted to state apartments and suites de luxe; three ballrooms; three restaurants; a promenade, or gallery, a tenth of a mile long; spacious lobby; mezzanine and a palm court. The associate architects were Robert F. Beresford and Warren & Wetmore.

The Mayflower building is of the steel skeleton type of construction with tile and reinforced concrete floor slabs supported on steel beams. In order to eliminate columns as much as posisble from the large public rooms a great many of the steel columns above the second floor are carried on huge steel girders which span the width of these rooms. This is one of the features which contribute to the general effect of spaciousness and noble proportion first recognized by the beholder.

The exterior of the building is of Indiana limestone in the first story. Above this is rough texture buff brick with terra cotta trimmings to match the limestone. All entrances to the building are sheltered by handsome marquises extending to the curb.

On entering the building from Connecticut Avenue there is revealed a vista over 400 feet long extending through the hotel to the entrance on Seventeenth Street. At its narrowest point, which is the width of the gallery or promenade, this view has a width of 26 feet, broadening into the main lobby and palm court.

THE MAIN LOBBY

The main lobby is 56 feet wide by 87 feet long. It is lighted from overhead by a skylight glazed with a special diffusing glass. Electric lights concealed above the glass ceiling also light the lobby at night. The very pleasing color effect in the lobby is obtained by the combination of the rich hangings and furnishings with the polished Botticino marble which lines the walls and faces the columns to the full height of the lobby. The capitals of the columns are treated in Antique Gold. The floor is of pink Tennessee marble, combining beauty with durability. The stairs leading from the lobby upward to the mezzanine and downward to the garden are of St. Genevieve Golden Vein marble.

Surrounding the lobby on three sides is a mezzanine floor where are writing nooks and lounging spaces for guests. Here the window sills are of Verde Antique.

Occupying one side of the lobby is the front office. Of the fixtures here the woodwork is American walnut with marquetry trimmings, but the counter is of Verde Antique marble, recognized as one of the best material for withstanding the wear which this counter receives. A base of marble also extends along the front of the office.

The lobby is provided with two direct

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The beautiful palm court is a large room with walls of Caen stone and a wainscot of St. Genevieve Golden Vein marble. The floor is of Biesanz American Travertine.

street entrances, a ladies' entrance in addition to the main entrance from Connecticut Avenue giving access from De Sales Street.

From the main lobby opens the elevator lobby, treated in the same materials, while directly opposite the four high-speed passenger elevators a large semicircular alcove forms an attractive feature. This is lined to its full height with polished Botticino marble.

THE PALM COURT

On leaving the elevator lobby to approach the palm court a descent of four or five steps is made. From the top of these steps is an excellent vantage point from which to see and be seen, and this was effectively made use of on the occasion of the Charity Inaugural Ball with which The Mayflower was formally opened. During the evening the Vice-President, the governors of the various states and other high officials were admitted through the Connecticut Avenue entrance after the guests had assembled in the palm court and ballroom. As each dignitary arrived he was escorted through the main lobby to the head of this short flight of stairs. Here he was halted while a fanfare was sounded by trumpeters, after which to the music of his state anthem he marched through the palm court and promenade and into the ballroom, where a box was in reserve for him.

The palm court is 76 feet wide by 86 feet long, truly a room of abounding spaces. The center portion of the ceiling is a great dome of green latticed glass, through which the daylight streams in generous measure. Surrounding the court is a wainscot 3 feet high of St. Genevieve Golden Vein marble. Above this the walls are of Caen stone and are interestingly featured at various points by the insertion of shallow niches. The perspective of these niches is so heightened by converging lines of wood lattice and Jaune Nile Fleuri and Belgian Black marble as to give an effect of considerable depth. To the middle of the south wall of the palm court the eye and ear are at once attracted by the cool splash of water in a charming wall fountain, a large and beautifully shaped sea shell of Jaune Nile Fleuri supported by two dolphins, while above it a mask spouts into it a tinkling stream of water. From a concealed spotlight in the ceiling a shaft of light plays on the fountain, flooding it, yet not spilling out upon the polished marble that serves as a background to the whole. The fountain base is of St. Genevieve Golden Vein marble. At each side of the fountain are polished marble monolith columns. The floor of the court is of Biesanz American Travertine.

PRESIDENTIAL RESTAURANT

Opening from the palm court is the main restaurant, a room 48 feet wide by 169 feet long. It is lighted by a series of nine long windows opening on the De Sales Street side. The keynote of this room is the semi-official atmosphere produced by the wall decorations, which consist of the coats-of-arms of the States of the Union and oil portraits of George Washington, John Adams, Thomas Jefferson and James Madison.

The ceiling is ornamented in low relief. As a protection to the walls and columns there is a 4-foot wainscot of white Alabama marble. In winter the draperies at the windows are in a general scheme of red and gold, while the floor is entirely covered by a figured carpet. In summer the carpet is removed and the marble floor exposed to view. This is of white Vermont marble squares with Verde Antique dots at the corners. Around the room is a border of Italian-Pavonazzo.

PROMENADE OR GALLERY

Continuing along the axis of the vista first viewed on entering the building, and crossing the palm court, one enters the promenade. At this point of entry is a set of glazed doors which permit the promenade and ballroom being completely shut off from the remainder of the first floor for the purposes of private functions. The promenade is 26 feet wide and 212 feet long. It has a coffered ceiling. All openings have molded architraves of white Alabama marble and the same marble is used for the wainscot. At intervals against the walls are lighting standards consisting of lofty pedestals of Verde Antique, fluted and carved and surmounted by elaborate metal candelabra. The floor is of white Vermont marble with squares of Verde Antique and border of the same.

BALLROOM

It is a common experience in hotels where the ballroom is situated above the street floor, to find a large ball or convention completely demoralizing the elevator service for guests. At The Mayflower this condition cannot obtain since the ballroom is situated on the ground floor. Although The Mayflower's grand ballroom has held as many as 1,800 persons, there is always freedom of access to it without disturbance to the other occupants of the hotel. En-

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The charming marble fountain in the palm court is of Jaune Nile Fleuri marble, of rich yellowish brown.

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The ballroom wainscot is St. Genevieve Golden Vein with a Black and Gold base.

trance to it is had through the promenade on one side, and at one end through the foyer, or small ballroom, and to this entire section a separate street entrance of five doorways, reserved exclusively for functions, is provided on the Seventeenth Street side of the building.

The ballroom has a richly ornamented vaulted ceiling. This ornament is carried down the sides of the columns until it reaches the top of the wainscot of St. Genevieve Golden Vein marble. Below the wainscot the base is of Italian Black and Gold marble. These two marbles form a very rich and effective color combination. The floor, for dancing purposes, is of patterned maple, specially selected for color. At one end of the ballroom is a stage which, by concealed apparatus, may be extended several feet into the room and when not in use retired to the wall line. At the opposite end of the ballroom is a motion picture booth, a unique feature of whose complete equipment is a periscoping device by which pictures are projected to the screen from the balcony without interference from the huge crystal chandeliers that hang from the ceiling. The ballroom is also equipped with a battery of high-power lights which permit the taking of motion pictures without the use of the usual flash-lights.

The entrances to the ballroom are of such width as to permit the use of this great salon for automobile exhibition purposes. The steps leading from the promenade into the ballroom are supported on each side by curved monoliths of Italian Black and Gold marble, chosen for their permanence and stability, as well as for their beauty.

FOYER

At the east end of the ballroom an dserv-

ing as an assembly hall as well as a room for private dances, luncheons or banquets, is the foyer, or small ballroom. The decorative treatment of this room is striking and unique. In the French Chinoise style—the French interpretation of Chinese art—the walls are of vivid blue with Chinese murals in gold, the ceiling being in the form of a large oval dome decorated with Chinese figures. The floor is of maple, the base of Verde Antique marble.

THE GARDEN

Washington society is enthusiastically patronizing the tea, dinner and supper dances that are a feature of The Mayflower's entertainment. These are held in the garden, a spacious room situated beneath the main lobby and easily accessible by elevators and broad staircases. The garden has a large dance floor of maple with a border of Belgian Black marble. The table spaces surrounding the dance floor are of American Kato stone in irregularly broken slabs. The walls, of rough stucco, are softly tinted. One side of the room consists of a series of alcoves suggestive of latticed arbors, each alcove seating about a dozen persons. The ceilings over the table are handsomely coffered, that over the dance floor giving an outdoor effect by crossed latticed beams from which lanterns are hung, the spaces between being painted to represent the evening sky. At the farther end of the garden a latticed colonnade encloses a charming figure fountain of St. Genevieve Golden

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The garden, though below the street level, has an out-of-door aspect.

Vein marble, with a mural background representing the city of Washington and surrounding country including a glimpse of Mt. Vernon, all quaintly conceived in landscape effect. The entire atmosphere of the garden is suggestive of the open air, although the room is in reality well below the street level under the main lobby floor. In summer the garden is a delightful spot, cooled by a special refrigerating system by which the warm air is drawn from the room and replaced with a stream of fresh air that has been washed and cooled by forcing through hundreds of jets of ice water. The air is thus kept constantly in motion and is fresh and exhilarating. Entering the garden on a hot summer day one will soon be so comfortably cool that dancing has an irresistible appeal. By a special lighting apparatus the garden is bathed in a flood of varied hues while in the center a revolving crystal ball reflects a kaleidoscopic play of colors upon the dancers.

MAIN KITCHEN

A hostelry of such proportions as The Mayflower demands, of course, a kitchen of commodious size. The main kitchen is 130 feet wide by more than 200 feet long. In this is installed the finest equipment and finish that money could buy. The kitchen has a capacity of 6,500 meals a day. It is electrically equipped throughout, special apparatus performing many of the manual labors of the establishment. Vegetable peelers, ice cream freezers, bread mixers, meat choppers, drink mixers, subveyors and endless belts for conveying soiled dishes from the serving pantries to the dish-washing machines, bread and meat slicers, etc.—all are electrically operated. For the service of employee cafeterias are maintained, one each for white and colored help. There are also separate locker rooms, shower baths and lavatories for each of the various classifications of help. The shower partitions are of pink Tennessee marble chosen for sanitary reasons for its impermeability. Toilet partitions are of White Vermont marble. The Mayflower has its own completely equipped laundry for its own purposes and the service of its guests. It maintains also its own valet establishment.

MECHANICAL PLANT

Accomplishing the entire work of heating the building in winter and air cooling it in summer, furnishing steam and power to the main kitchen and laundry, manufacturing all the ice used in the hotel as well as refrigerating all ice boxes throughout the building, supplying hot and cold water to all fixtures and running ice water to all guest rooms, supplying artificial ventilation to all public rooms, operating a central vacuum cleaning department, and numerous other services, The Mayflower's mechanical plant is a huge and complete affair. The boilers for heating and power are fired by fuel oil burners.

Throughout the building the interior finish is of the highest quality material. All rooms and corridors have moulded plaster cornices and paneled wall mouldings. The corridors are broad and well lighted. The main corridor continues through to the exterior wall where two large windows afford light and air. All corridors and floors are carpeted with a heavy figured carpet to within 2 feet of the walls, where borders of polished white Alabama marble carry to the wall bases. All windows throughout the building are glazed with plate glass. All partitions are of fireproof materials, the door frames and trim being of steel as a further precaution against the spread of fire.

As a public hostelry The Mayflower is unquestionably unique in one important re-

spect: the luxuriousness of its appointments. Its furnishings are the selections of an impeccable taste and discretion ranging without stint among art collections and the products of factories famous for the authenticity of their reproductions of period styles and museum pieces. The rooms and apartments are not "furnished" with "sets"; no two alike, they are appointed with carefully chosen individual pieces, each having its special interest for grace, beauty and refinement, and in careful harmony with the color schemes of the rooms. These, with their drapes and bed-hangings of silk, many with over drapes of satin damask; bed lamps and boudoir lights with silken shades; objects of art in harmonious colorings; original watercolors, mezzotints and etchings on the walls—have all the distinction and charm of private dwellings. Each guest room has outside exposure and private bath, with circulating ice water. In the more than 100 semi-housekeeping suites including living-room 26 feet long, dining-room, bedrooms and baths, perfectly equipped kitchens with individual ice machines, electric ranges and complete service of china, linen and silver, is given every facility for the comfort and convenience of permanent guests. An unusual feature of these apartments are the open fireplaces designed for a real open fire and faced with Italian Botticino marble. Special attention to requirements for quiet has designed these rooms with air spaces between the walls for deadening the sound. No entrance door opens directly from the corridor to the room, a small private lobby being provided in every case at the entrance. A private elevator and entrance lobby serve these apartments.

Occupying the entire ninth and tenth floors of a million-dollar annex just completed are the two state apartments, the Presidential and Vice-Presidential suites, the most sumptuously appointed hotel apartments in the world. Nothing to equal them is to be found anywhere in Europe or the Western Continent. Each a suite of thirteen rooms planned and equipped for permanent residence with drawing-room, dining-room, library office, five guest rooms each with private bath and glass-enclosed shower with silver fittings, kitchen and servants' rooms, they are as luxurious as any Old World palace, together with all the modern conveniences inseparable from American ideals of comfort. With their Oriental rugs, tables, consoles and cabinets of painted lacquer and marquetry, chairs upholstered in hand-woven tapestries and satin damasks, crystal, cloisonné and bronze and marble objects of art, original oils and engravings on the walls, satin and taffeta hangings to carry out the color harmonies, these are rooms indeed fit for the royal and other distinguished guests of the nation for whose entertainment they are designed. On the remaining seven floors of this annex, one to a floor, are the suites de luxe consisting of drawing-room and five bed chambers, but little less superbly appointed than the Presidential and Vice-Presidential suites above, and designed for guests who demand the ultimate in luxury and privacy.

The lighting features of the hotel, of elaborate and beautiful design, are striking and effective parts of its interior furnishing. Throughout the length of the promenade, in the palm court with its tinkling fountain, the Presidential restaurant and main lobby, the lighting effects are elaborate and beautiful. The wiring in The Mayflower was installed at a cost of $250,000. High-tension current entering through the sub-basement supplies the entire hotel through several groups of large transformers. Several hun-

dred motors, ranging from ¼ to 150 horsepower, operate the various electrical mechanisms throughout the hotel. To this end almost 100 miles of wire were utilized and six carloads of conduit were employed.

In the first few months of its existence The Mayflower has scored an unqualified success. The luxuriousness of its appointments and the completeness of its service have appealed instantly to travelers. It is a concrete expression of the principle that the artificial and the commonplace are not necessarily germane to the equipment of American hotels, and that the discriminating public does not need to compromise with unbeautiful surroundings when it travels.

One of the marble statues in the promenade of the Mayflower Hotel, Washington, D.C.

THE SEARS ACADEMY OF FINE ARTS AT ELGIN, ILLINOIS

AT Elgin, Illinois, there has existed for a number of years the Elgin Academy and Junior College. This institution has lately attracted considerable attention in the world of art because of the dedication, a little over a year ago, of a splendid new building intended to house a collection of representative American paintings.

This structure—the Laura Davidson Sears Academy of Fine Art—bears the name of the wife of the donor, Judge Nathaniel C. Sears, of Lake Geneva, Wisconsin, and formerly of Elgin. As it stands today, it realizes a long-cherished dream of Judge Sears, to build a monumental home for his collection of paintings and present it to the Elgin Academy in the name of his father, mother and wife. Judge Sears is chairman of the Board of Trustees of the Academy, and Mrs. Sears is a member of the Board. Moreover the Judge is a former student of Elgin Academy; his father was the first principal; his mother the first dean of women, and his wife a former student and teacher. The building is, therefore, truly a Sears Memorial.

During the years that Judge Sears dreamed over the project, and when his plans were nothing more than nebulous imaginings, he had made up his mind definitely to one thing: that he would not consider as worthy of his brain child any material other than white marble. The finished structure justifies his vision.

The building was begun in the spring of 1923, and was erected under the supervision of Harry F. Rich and his associate, Harry F. Robinson, architects of Chicago.

The north front, showing the main entrance and portico.

It is a huge imposing structure of white Georgia marble, rectangular in shape and artistic in its simple decorative details. Every piece of the marble that was used was shipped to Elgin carefully crated, after selection had been made at the quarries. Uniformity of tone was the end aimed for, and the consequent lack of variation between the blocks, as well as their sparkling and almost iridescent whiteness, has a great deal to do with the beauty of the exterior.

The end walls are unbroken; the sides, one of which contains the main entrance, are adorned by marble balustrades over the cornice. The marble facing of the walls is 3 inches thick.

The building fronts east, facing the old Academy Main Hall directly opposite. Marble walks lead to the entrance portico, or loggia, the floor level of which is reached by ascending a short flight of four low, broad steps, leading between six massive monolithic columns of the Grecian Doric order, gracefully fluted. The architrave above is inscribed, in bold letters, with the name of the Academy.

Within the marble porch the floor has Creole marble borders with white panels. Above the simple main doorway is a handsome frieze, extending around the three sides of the loggia. This is a copy of the Elgin marbles of the frieze of the Parthenon and forms the chief decorative feature of the east façade. Its position, however, high up on the walls, and half hidden by the monoliths, only affords a greater contrast to the severely dignified lines of the design.

There are five exhibition rooms and a curator's office, the latter with a mezzanine floor reached by a winding steel stairway. All the exhibition rooms are top lighted, with powerful reflector units for night lighting. The interior is finished in mahogany with neutral gray canvas (Monk's cloth) walls. The basement contains shipping room and lavatories.

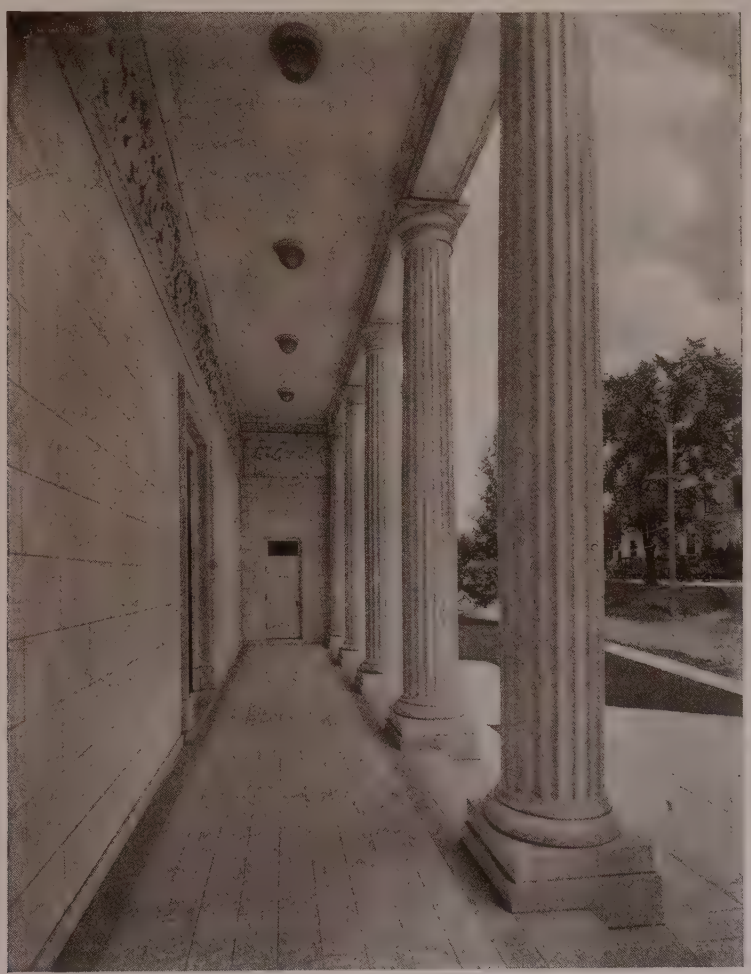
As mentioned before, the gallery is devoted entirely to American art. It houses, chiefly, the Sears collection of 127 paintings by American artists, and this fine display includes the work of practically every great artist since the growth of American art attained a degree of development worthy of recognition as such. No new paintings are allowed to appear in the gallery until their authors have gained sufficient reputation to command notice in contemporary books of criticism.

That the $350,000 spent by the donor on the gallery and paintings has been wisely disbursed is proved by the favorable notices in art circles. Typical of these comments is the following extract from the *Baltimore Sun:*

"Retrospective exhibitions which tend to gather from distant corners of the land hitherto unknown as well as works of Early Americans have been steadily increasing in number and efficacy. The work of Benjamin West, at the Philadelphia Art Alliance in 1920, became the forerunner of comprehensive exhibitions of canvas by Thomas Sully and the three Peals staged in successive years at the Pennsylvania Academy of Fine Arts.

"And now as a new idea in the collection of Americans, the Sears Academy of Fine Arts at Elgin, Illinois, has inaugurated a historical sequence of American Art, and is endeavoring to obtain an example of the work of every American painter, be he master or apprentice."

Whether the last assertion is literally true or not, certainly the Sears Academy possesses a representative showing of the work of many painters in history, from Pieter Vanderlyn to Gardner Symons and Jane Peterson. In addition, the Octagon contains marble copies of six statues, including Canova's Venus and Dannecker's Ariadne.



Details of the portico of the Laura Davidson Sears Academy of Fine Arts, at Elgin, Illinois.

A LOS ANGELES STORE FRONT

A Black and Gold Marble Treatment that Suggests Many Artistic Possibilities

THERE will probably be at the end of the next ten years at least ten cities in America with a population exceeding the two million mark. One of these is almost certain to be Los Angeles.

Los Angeles is growing rapidly. Every resident is a booster for his city and with very good reasons. The climate, the natural advantages of location, the rich soil, furnish incontrovertible arguments for a residence in the coming metropolis of the West.

Added to these is the spirit of progressiveness displayed by the people of the city. An interesting evidence of this spirit is the new jewelry store of Feagans and Company pictured above. This building is located on the corner of Seventh and Olive Streets, the center of the finest shopping district in the city, and the most exclusive.

The store occupies the first floor corner under the Los Angeles Athletic Club, and the remodeling of the space ran considerably in excess of $200,000. The material used in the exterior of this building was Black and Gold marble, in combination with very elaborately designed statuary bronze, the latter for the show-window frames and pilasters, and for the pilaster bases and caps. The architects were L. and E. Emanuel, of San Francisco.

The shop has attracted considerable attention, and has been pronounced one of the most artistic jewelry stores in the world. When asked for the inspiration which prompted and supported them in the planning and conception of this splendid store. Mr. George E. Feagans, the president of the company, said: "First, we chose our archi-

tect-designer and with him made a complete tour of America and a careful survey of America's finest stores and shops—and we say proudly that America has the finest shops and stores in the world. After a careful analysis of all this gathered and tabulated data, we started our drawings and specifications, this consuming well over a year, for we made many changes and rejections.

"When our plans, therefore, had progressed far enough so that we knew definitely the motif and foundation for our treatment, we went then to Europe and to Paris and to the Louvre—that great museum of art, and architecture and painting, the equal of which no other city in the world can offer. There we found the color scheme for our ceiling—soft, rich golds, together with subtle Gobelin blues, with here and there for added interest a bolder dash of color.

"In the palaces of Versailles we found crystal pendant candelabra chandeliers, hung there in the extravagant days of the Louis periods, and we found manufacturers in Paris that could not alone duplicate them but improve on them and make them for us more beautiful and more practical than the original.

"French display tables and display cases, richly embellished were also sought and found in Paris.

"Again we found in Paris marble of every hue and texture from quarries dating back, some of them, to the days of Babylon. There seemed but one marble suitable for our adopted motif to combine with real bronze for our outside work and that was the Black and Gold marble of Italy. This marble is quarried on the Isle of Palmaria, in the Gulf of Spezia and at Partovenere, near Spezia, in Liguria. It is known as Portoro or, more familiarly as Black and Gold. But our total of window frontage was 141 feet, to be solid plate glass, bronze and marble from sidewalk to upper window coping, requiring therefore many tons of marble. So special shipment from a foreign country at first seemed prohibitive. However, we found this marble right here at home in Los Angeles. As a result, we have a marble exterior in perfect harmony with our interior; and when we consider the size of our exterior, 141 feet, with every single bit of marble matched and fitted carefully to place, then we believe that it is without parallel in America."

Feagans and Company were not the first to make use of this very colorful material for shop fronts, not even in Los Angeles. It has been held in very high regard among the architects of this country for a number of years; of late, however, it has begun to enjoy a very much increased vogue, being used frequently for interior work as well, notably in the lobby of the fine new American Radiator Building in New York City.

Detail of one of Feagans and Company's display windows, showing the marble.

David, by Michelangelo. Finished in 1503, it stood in the Piazza at Florence for 369 years, the marble undamaged by exposure to the air.

MICHELANGELO AND CELLINI

The Foremost Sculptor and the Most Gifted Goldsmith of the Renaissance in Italy

PART I

"THE apotheosis of Italian sculpture," wrote Ernest H. Short, "connects itself as inevitably with Michelangelo as the topmost peak of Elizabeth drama—Shakespeare—connects itself with the dramatic hills and hillcocks which led up to it."

Michelangelo alone was able to give to marble the power to express the profoundest thoughts of nature and humanity which were conceived during the Italian Renaissance. Not to be mentioned in the same breadth with Michelangelo as a sculptor, but nevertheless the leading goldsmith of his time, was Benvenuto Cellini, the Florentine swashbuckler.

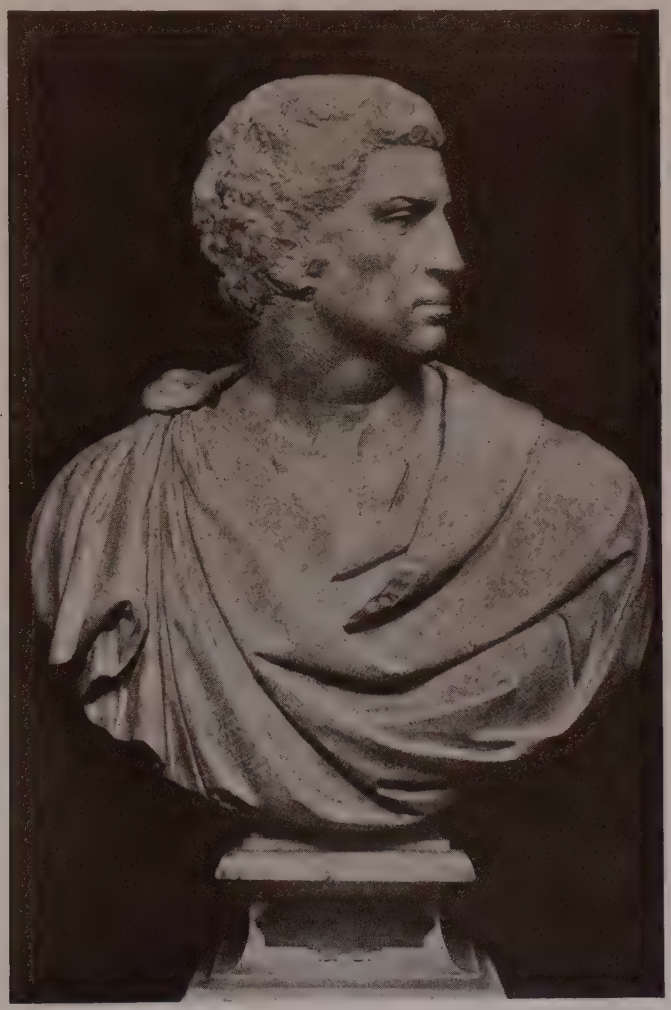
Any attempt to offer here anything more than a brief mention of some of Michelangelo's extant works and a few pertinent incidents of his career would be impossible. We can only hope to show, in a general way, the high lights of his life, and his connection with the political factors of his age.

Born at Caprese, near Arezzo, in 1475, he grew up in the village of Settignano, three

Illustrations courtesy Thomas Machen, architect, Baltimore, Maryland.

miles from Florence. His nurse was the daughter of a stone-carver and the wife of a stone-carver, so that it was small wonder he early delighted in the use of the chisel. A youthful friendship with Grenacci, a painter, a pupil of Domenico Ghirlandaio, one of the most famous painters of the day, also encouraged him in the use of the brush.

A painted wood panel which he made at this time drew considerable attention to his ability. When this was followed by such a faithful copy of a drawing of a head that the two could not be told apart, his reputation began to spread. It happened one day that Granacci took him to the gardens of the Medici at San Marco, where Lorenzo had collected many antique statues. He was struck by their beauty, and spent many days copying them. One in particular, the head of a faun, he determined to reproduce in marble. He secured a piece of this material from some masons engaged on the premises and, having borrowed a chisel, set to work and soon had it completed. His imagination supplied such details of the face as were missing in the original antique, and this



The bust of Brutus, begun by Michelangelo for Cardinal Ridolfi in 1534 and finished by Calcagni. It is now in the National Museum, Florence.

One of the "Bound Captives" presented by Angelo to Roberto degli Strozzi. They were intended for the tomb of Julius. They are now in the Louvre Museum.

with such fine effect that the work attracted the attention of Lorenzo himself. He was taken into the household of the Magnificent and stayed there for two years, meeting many notables and persons of nobility and working constantly in the gardens, pursuing his studies.

Following the death of Lorenzo in 1492, he returned to his father's house. He is reputed to have bought a large piece of marble, that had for many years been exposed to the wind and rain, and carved a Hercules out of it that was ultimately sent to France. Nothing is now known of this. Another work, a crucifix in wood for the high altar of Santo Sprito in Florence, has also disappeared, though Condivi, a friend and pupil of the sculptor, speaks in detail of both of these.

He left Florence for Bologna about the time that the House of Medici was hunted out of Florence, and lived a little over a year with Gian Aldovrandi, a gentleman of means and a member of the Sixteen. Here he did the marble figures for the Ark of San Domenico, a San Petronio and a kneeling angel.

Returning to his native town, he set out

to carve a marble God of Love. He was persuaded by Lorenzo di Pier Francesco to give to this cupid an appearance of age, so that it could be passed off as an antique. The trick was successful and the statue was bought by a dealer and sold to Cardinal di San Giorgio for 200 ducats.

In 1496 he went to Rome and had no difficulty obtaining commissions for work. For Jacopo Galli he carved a marble Bacchus, of merry aspect, with squinting eyes, and holding a cup in his right hand and a bunch of grapes in his left. An impish and alert little satyr at his feet furtively nibbles at these grapes. This work in form represents the decadent Græco-Roman execution of the later empire. Jacopo also had Michelangelo carve for him a cupid, now in the Victoria and Albert Museum.

A short time afterward he carved for the Cardinal Rovano, from a block of marble, that splendid statue of Our Lady, now in a chapel in the nave of St. Peter's. The Madonna is seated on the stone upon which the cross was erected, with her dead son on her lap—the story of a divine grief of a mother for an all-perfect offspring.

Family affairs compelled his return to Florence and while there he carved the colossal David, now in the Accademia delle Belle Arti of Florence, where it was placed for its better preservation in 1873. It was completed in 1504 out of a block of marble brought from Carrara by Agnostino di

Marble blocks at Marina, taken from Italian quarries, awaiting shipment.

Duccio. In this endeavors to save labor in the shipping, Agnostino had roughed this block out on the quay itself in such a clumsy way that "neither he nor any one else had the courage to put their hands to the block to carve a statue out of it, either of the full size of the marble or even one much less" (Condivi). The Office of Works had come in possession of this stone; they had sent for Michelangelo and offered it to him. He accepted it and extracted from it the statue above mentioned, "so exactly to size that the old surface of the outsides of the marble may be seen on the top of the head and in the base."

Michelangelo also executed, about this time, a marble group of the Madonna and Child, now in the Cathedral at Bruges; and a series of Madonna reliefs, strongly reminiscent of Donatello's style.

The Pieta and the David are typical works of Angelo's first period—a period in which may be seen at their height the influences of the spirit of humanism. It is, however, the works of his second period that indicate a deep philosophical poetry that inspired his most characteristic labors —the monuments in the Medici Chapel at Florence and the Tomb of Julius II. Neither was ever finished, unfortunately, but we can guess at the latter from rough sketches, some measurements and the well-known Moses.

Julius II called him to Rome in 1505 to prepare a design for a sculptural monument on a gigantic scale. The plan included thirty-eight life-sized statues, and Julius sent him to Carrara to quarry the necessary marbles. An interesting account of this trip is given by Condivi as follows:

"Michelangelo stayed in these mountains more than eight months with two workmen and his horse, and without any other salary except his food. One day whilst he was there he saw a crag that overlooked the sea, which made him wish to carve a colossus that would be a landmark for sailors from a long way off, insighted thereto principally by the suitable shape of the rock from which it could have been conveniently carved, and by emulation of the ancients, who, perhaps with the same object as Michelangelo not to be idle, or for some other end, left several records unfinished and sketched out, which give a good idea of their powers. And of a surety he would have done it if he had had time enough, or the business upon which he had come had allowed him. He afterwards much regretted not having carried it out. Enough marbles quarried and chosen, he took them to the sea coast and left one of his men to have them embarked. He himself returned to Rome, and because he stopped some days in Florence on the way, when he arrived at Rome he found the first boat already at the piazza of St. Peter's, behind Santa Caterina, where he had his workshop near the Corridore. The quantity of marble was immense, so that, spread over the piazza, they were the admiration of all and a joy to the Pope, who heaped immeasurable favors upon Michelangelo; and when he began to work upon them again and again went to see him at his house, and talked with him of monuments and other matters as with his own brother; and in order that he might more easily go to him, the Pope ordered that a drawbridge should be thrown across from the Corridore to the rooms of Michelangelo, by which he might visit him in private."

The great dream of the sculptured mausoleum was never realized. A vaster work had captivated the fancy of Julius—the rebuilding of St. Peter's. Added to this was the thought implanted in the mind of the Pope by Bramante that to build one's tomb in one's lifetime was unlucky. Bra-

Modern quarries at Carrara. Michelangelo spent many months in these mountains selecting blocks for the sculptural monument proposed by Julius. Condivi afterward aptly called the episode "The Tragedy of the Tomb."

mante had never been friendly to Angelo, knowing that the latter was familiar with the errors of construction in such works as Saint Peter's, the Corridore di Belvidere, the Convents di San Pietro and Vincula and other structures, and he therefore sought to have Angelo removed from Rome, or at least deprived of the Pope's favor. He suggested to the Pope that Angelo be assigned the labor of painting the ceiling of the Sistine Chapel.

Michelangelo soon found his position in Rome intolerable and secretly departed for Florence. This was in 1506 and he remained in Florence for six months, despite Julius' efforts to have him brought back. While there, he finished the cartoon for the Sala del Consiglio. He then went to Bologna, where, having received pardon from Julius for his previous independent actions, he executed a colossal bronze statue of the Pope for the façade of S. Petronio, commemorating victory over the Bentivogli.

For almost twenty years after the project for the Julian Tomb, Michelangelo produced no great sculpture. After the Bologna statue was completed, he repaired to Rome and was engaged until 1512 in decorating the Sistine Chapel vault. His next statue was the Christ, in the Minerva at Rome.

(Part 2 will follow in September issue.)

The statue of the "Risen Christ," executed by Michelangelo in 1520 and forwarded in the rough to Rome, where it was finished by Pietro Urbino and Federigo Frizzi. It is now in the Church of the Minerva.

A HANDBOOK OF MARBLE

It is the purpose of the National Association of Marble Dealers, to publish as soon as possible, a handbook on marble. The material contained in this book will be contributed by those best qualified to speak in an authoritative manner on the various matters treated. This is the fourteenth installment and contains part of the fourth chapter, written by John Stephen Sewell, President of the Alabama Marble Company. These extracts will probably undergo some slight changes before appearing later in book form.

CHAPTER IV—Finishing Marble (*Continued*)

PROBABLY any abrasive wheel will cut faster as its speed increases. When a projectile strikes a steel plate at high velocity, it often goes through and suffers little deformation itself; the work is nearly all done on the target; at a lower velocity the projectile may break up and the plate be little damaged. A piece of soft tallow candle may be fired through a plank, making a clean hole—but the candle, with diminishing velocity, is sure to be splattered over some subsequent target beyond the plank. Given sufficient velocity, a drop of water would similarly pierce a plank, or kill a man. The stream of water issuing from a nozzle under very high pressure will behave like a rod of steel if struck near the nozzle with a stick or bar; it may be impossible to cut through the stream with an axe.

A particle of carborundum traveling at high speed in contact with marble does work on the marble in a manner somewhat analogous to that done by a projectile on a target. Probably if the speed of the carborundum could be indefinitely increased, the rate of cutting would also continuously increase—but whether the two rates would be proportional to each other or connected by some other law is not known. However, there are limits in this direction also. Carborundum is about as hard as diamond, but not nearly as tough. A sharp projecting point or corner of a carborundum crystal soon crumbles away, and unless fresh points and corners can be exposed, the wheel loses its cutting power. The wheels are made by mixing carborundum grains of a proper size with some sort of binding material and moulding to proper shape. The wheels may be subsequently dried, or even baked, or burned in a kiln. The bond used in wheels for cutting marble must wear away about as fast as the grains of carborundum crumble, so as to keep fresh, sharp edges and corners always exposed and available for cutting. In the case of all bonding materials which are satisfactory from this point of view, there is a very moderate tensile strength, hence a very distinct limit to the peripheral speed of the wheels which is possible without a danger of rupture from centrifugal force.

When carborundum wheels are working on marble, they tend to become glazed, so to speak, with pulverized material; this greatly diminishes their cutting power. Jets of water, under considerable pressure, directed against the work and the adjacent parts of the wheel, are of considerable assistance in diminishing this trouble; a little fine sand thrown in with the water from time to time will also help. But it is always necessary to suspend operations from time to time and dress the cutting surfaces of the wheel with a tool made for the purpose. Of course, unless the wheel cuts into the work as fast as the work is fed against it, the wheel will break, or, if it is very stout, the machine will stall in some way.

A carborundum machine equipped with auxiliary attachments for turning a column base. The base here is made up of four pieces.

It is evident that, in dealing with the speed and cost of carborundum work, we are confronted with a function of many variables and that some of them are susceptible of control only within narrow limits. So far as known, no thorough and complete scientific investigation of this question has ever been made. From some tests carried out by competent engineers, the following isolated facts have been established:

1. Within the limits of the total power available, the power cost per cubic inch of grinding away marble diminishes as the rate of cutting increases. The curve that expresses the relation seems to approximate one branch of an equilateral hyperbola.

2. Rates of cutting varying from 6 or 7 cubic inches per minute to about 50 cubic inches per minute have been observed. The greater rate was on coping which included deep cuts, the lesser was on moldings; probably with delicate members.

3. The percentage of time actually cutting to the total running time was very variable.

The engineer conducting the tests re-

marked that no reliable basis for predicting costs had been found, and that it was not likely to be found, until practice was at least approximately standardized. The marble working fraternity may add to that, that standardization, in the sense intended, is not possible now, and is not likely to become so, from all that can at present be seen. However, in a later chapter, an analysis of this subject will be presented which, it is believed, may be made the basis of a reasonably accurate system of estimating average costs.

TURNED WORK

This is, in some respects, the simplest form of cut work. If individual monolithic drums or shafts are of considerable size, it pays to saw them square in the gangs, then cut them to octagon shape either in the gangs or with a diamond saw. Shafts and drums can be turned with carborundum wheels of plain rectangular diametral section because the entasis bar will keep the cylindrical face of the wheel always tangent to the finished surface. Of course, circumferential fillets and beads must be cut with a wheel shaped to the proper profile.

Columns in which segments are built up into drums can have the segments assembled into drums on wooden centers and turned as though they were monolithic, or the segments may be separately finished to proper patterns and templates in the planer type of carborundum machine.

Balusters are often turned in small lathes, fitted with a battery of wheels shaped so as to fit the entire longitudinal profile of the baluster, at one time. If any part of the cut in such a case is very deep, it may pay to cut into the baluster at this part, with thin wheels about an inch apart, so that much of the surplus material can be knocked off. This operation is carried out in the lathe—of course, before the solid battery of wheels is put in place.

Some lathes are horizontal and some vertical. The vertical lathes resemble, in some respects, large boring machines. They possess advantages for handling cranky and unsound marbles—especially where there is danger that a long shaft would break under its own weight, in a horizontal lathe.

In the latter case, however, it is always possible, by turning or cutting short sections of the shaft to circular form, to provide intermediate rollers supporting the shaft at several points so it may be turned in a horizontal position.

If a shaft is to be made of marble that is unsound, a hole may be bored through its center, from end to end, and a steel pipe or shaft inserted to give it the necessary strength.

In such a case, the hole through the column shaft must be larger than the pipe or the piece of steel shaft, so that the latter can be inserted and then solidly grouted in.

Columns or drums can be fluted in a lathe, by means of a suitably shaped wheel, mounted and travelling on the entasis bar, from one end to the other. Of course, in this case, the lathe does not turn. The ends of the flutes in Corinthian and Ionic columns must be finished by hand.

In a vertical lathe, the flutes, in the case of individual drums, may be cut out by diamond drills. In the case of columns built up of drums—whether the drums are monolithic or themselves built up of segments—the complete column should be assembled in the shop and the fitttng of its parts completed by skilled mechanics. Then the pieces should be marked so that they will be assembled in exactly the same way at the building, otherwise there is sure to be trouble. Small inaccuracies are much less expensive to correct at the shop than elsewhere.

Column bases can be turned, of course, the same as shafts or drums, or balusters. Where a square plinth and a torus are in one piece, turning the lower part of the torus, where it joins the plinth, is something of a nuisance. It is better, usually, to make them separate and then dowel them together.

As already stated, any surface that can be turned can also be gritted and polished in the lathe by speeding up the latter and keeping the necessary gritting and polishing materials pressed against it—by hand. If a plinth is monolithic with a torus, it must be completely finished by hand; whereas, if it is separate, in some cases at least, it can be finished like other plain work, by machine. Gritting and polishing turned work in a lathe is somewhat more expensive than that done by gritting and polishing machines on plain work, but it is much less expensive than outright hand work.

MOULDINGS

Moldings are almost invariably cut on carborundum machines of the planer type. Normally, wheels revolving on horizontal axes (or "arbors") are cut to the desired profile, and the strips of stock are run under them, molded face up; if any portion of a moulding is "undercut," it must be done either by hand or else by a special wheel or wheels; this involves "getting ready" just the same as for a new molding, and resetting the work in the machine, so that the undercut may face the wheel. An undercut might be so located that there would be insufficient lateral clearance for a wheel, in which case it must be done by hand. In any case, an undercut member adds very greatly to the cost of a molding.

By equipping a planer type of machine with an auxiliary platen and certain simple but ingenious mechanical devices (all of which are standard and on the market), the work may be made to move on the arc of a circle, of any desired radius. If mouldings are not too complex, they may thus be cut on curved pieces as well as straight.

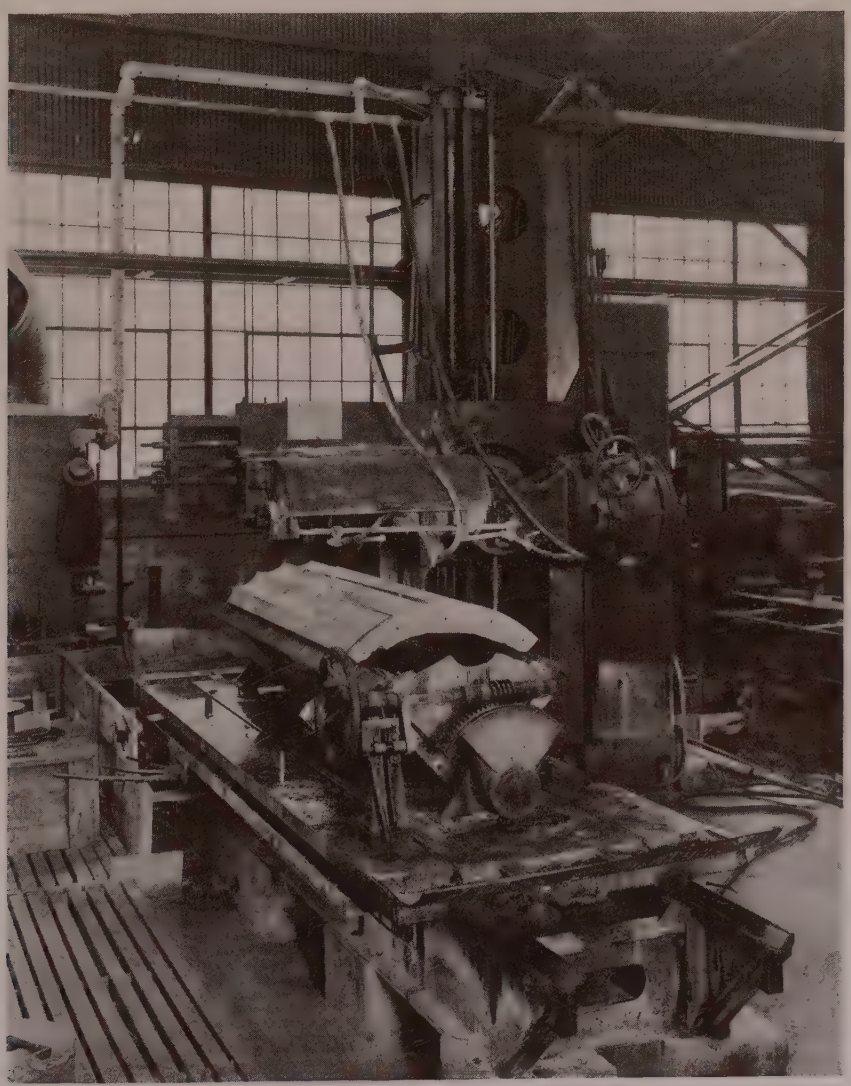
Exterior returns, *i.e.*, moldings returned across the end of a piece, may be cut in a carborundum machine if the pieces are short enough to be braced standing end up and still pass under the ordinary wheels. Otherwise, they may be cut by wheels revolving on a vertical axis, carried by an auxiliary head on the machine. If the pieces are long, and if the machine is not specially equipped, these returns must be cut by hand. Usually such returns are short, because the width of the pieces is not great. The labor cost on even the shortest of them is at least equal to that on a lineal foot of the straight mold, and if the length of the return approximates a foot, the cost is equal to that of from 2 to 3 lineal feet of the straight mold.

When a molding stops on itself, *i.e.*, when the molded piece ends with an interior return, the mold can be cut by carborundum up to the point where the wheel would begin to encroach on the return; the remainder must be "dug out" by hand. The cost of this operation is equal to the labor cost on from 3 to 4 lineal feet of the straight mold.

While a more detailed discussion of costs is reserved for a later chapter, it may be well to point out here that it costs as much to get ready to cut a few lineal feet of a given mold as for many feet. There is time lost while finished work is being removed and new pieces are being put in the machine; or while a wheel is being moved from one piece to another, where a number of similar pieces can be "loaded" at the same time; there is time lost in dressing the wheel, to keep it clean, and also to restore its profile as it begins to wear. All this time, as a rule,

the machine is devoted to the particular job, and its time efficiency, that is the percentage of time actually cutting to the total time, is relatively low. Probably from 50 to 100 lineal feet would be a high average for the quantity of any particular molding in an average job. Very rarely does the same molding occur in two different jobs, and still more rarely would the same shop have both of these jobs and at the same time.

If a given shop is to turn out any kind of work—heavy or light—it must have at least one or more of the heaviest and most elaborate and therefore most expensive machines on the market. These are best adapted for heavy moldings and heavy fluted columns built up in segments of drums. But no one shop can usually keep such a machine continuously employed on the type of work for which it is best adapted. These heavy machines have auxiliary attachments, enabling them to turn balusters horizontally and column bases vertically; and of course they can do light moldings as



Finishing a segment of a column drum in a carborundum machine. Special devices are employed to produce the entasis.

well as heavy ones. To keep them constantly employed, they must sometimes be used on work that could be done just as well on lighter and cheaper machines. While they do such work, as a rule, more rapidly than the lighter machines, the charges for the use of capital are so much greater, that the final cost is higher.

The above paragraphs indicate why standardization in shop methods in this business is, for the present at least, quite out of the question. It would require, to begin with, that architects should standardize that portion of the interior finish upon which they expend their utmost artistic efforts. If they did it, the results would be banal and monotonous. The saving in cost would be too dearly bought. So it is likely that every interior marble job will always be what they all are now—a finish made to measure for the individual building, just as a tailor-made suit is made to order for an individual man and is never duplicated.

After the carborundum work in a molding is completed, the work has still to be gritted, honed and polished. With the narrow surfaces involved, most of them curved, this work has to be done entirely by hand. The natural grits and hones are usually used in this case. Of course, the work is relatively expensive.

Any elaborate job of cut and molded work should be put together in the shop and all inaccuracies corrected. The profile of a given molding will change slightly from the inevitable wear on the carborundum wheels. This is noticeable only when an earlier and a later piece have come together. Then the "membering" is inaccurate and must be corrected by hand. As far as possible, the pieces of a continuous mold should be selected, matched, and cut to length before the molding is cut. Then they should be put through the machine in the order in which they are to be set in place. This will greatly diminish the amount of "fitting" required to insure a good job.

One who is familiar with the care and selection required to produce harmonious matching and blending of pieces throughout a job—especially when the marble is richly colored and boldly marked—can well understand that if a piece gets broken at any stage, it is better for all concerned to mend and patch it than to try to find another that will be a satisfactory substitute for it. This is a source, at times, of bitter disputes, but fortunately it does not occur very frequently.

The lighter carborundum machines are of a great variety of patterns. Some of them are like open side planers, some are specially adapted for ripping slabs into narrow strips; some for cutting relatively narrow strips to length. Nearly all of them are more or less well adapted for more than one use because of the difficulty of keeping them constantly employed on any one type of work.

CARVING

Carving is nearly always done by hand. The only improvement is the introduction of air tools in place of the old mallet and chisel. There are machines, of European make, which will duplicate a carved model if it is not too complex nor too deeply undercut; they will do a large part of the work, in any case. But they are not in general use, probably because the amount of work for which they are adapted and on which they effect a saving is not very large.

In any case, when the final fitting is taken into account, along with the carving and the hand work in molded members, interior marble is a material that still receives its final touches from the hand of the skilled craftsman.

May it always remain so!

A LIST OF THE WORLD'S MARBLES

By J. J. McCLYMONT

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

GROUP A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

GROUP B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

GROUP C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

GROUP D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

Marpessa—See Parian.

Marquise or Marquese.
One of the Napoleon marbles.
Quarried near Marquise or Marquese, close to Boulogne-sur-Mer, France.
Brownish-gray or creamed coffee color with veins which vary from white to auburn.
Another variety, called Pink Marquise, is pink with veins as above. And the third variety, known as Marquise Fleurie, is a pinkish-purple with veins. (Blagrove.)

Marquise Fleuri—See Marquise.

Marseilles Quarries
The quarries at Cassis (see Marbre de Cassis) are about ten miles from Marseilles, and the production is sometimes known as Marseilles marble.

Marston (Madrepore)
Quarried at Marston, Somersetshire, England.
Blackish-brown with pale yellow spiral-shaped fossils. (Blagrove.)

Marvilla Marble or Maryland Marble and Chalen Marble.
Quarried at Cockeysville, Maryland.
Variegated bluish-gray and greenish-white.

Marshall County Marble—See Iowa.

Martyrs Stone—See Pietra Nepritica.

Marwal
Quarried near Marwal, Lot, France.
Reddish. (Blagrove.)

Marxgrun Quarries
See Bavarian Green, Red and Rose.

Maryland Black—See Antwerp Black.

Maryland Green—See Cardiff Green.

Maryland Marbles

The Beaver Dam Quarry at Cockeysville, Baltimore County, and the Cardiff Quarry at Cardiff, Harford County, were the only quarries operated in 1921. (U.S. Geological Survey, 1921.)

Maryland Serpentine—See Cardiff Green.

Massa

A small town situated among the hills about four miles from Carrara, near which are many Italian quarries.

Massachusetts Marbles

According to U.S. Geological Survey Stone, 1921, the Lee Quarries at Lee, Berkshire County, and the Westfield Quarries at Westfield, Hampden County, were the only quarries producing building marble in 1921.

Matapan Cape—See Rosso Antico.

Matifoux

Near Matifoux, Algiers, Africa.

Gray varying to yellowish or bluish shades. (Blagrove.)

Matrix

The general mass of a rock which has isolated crystals or mineral particles, sometimes called the ground mass.

Mauretania

Numidian marbles from Algeria are on Montagne Grise in Algeria in what was the Ancient Province of Mauretania, which included what is now known as Algeria, Morocco and Tunis, Africa.

Maurin Quarries—See Vert Maurin.

Mauve Jade—See Burmese Mauve Jade.

Mayenne Marbles—See Gris Bois Jourdon, Gris Louverne and Rose-de-la-Peliviere.

Mayumiyama—See Black and White (Japan).

Mazzano—See Botticino.

Mazy Quarries—See Noir Belge.

McMullen Gray—Group A.

Quarried near Knoxville, Tennessee.

Decided gray with occasional light veins and crow feet. Available in slabs only.

Meadow Gray

See Tennessee Gray.

Quarry located at Knoxville, Tennessee.

Slightly mottled gray.

Not being produced.

Medium Cippolino or Medium Cippolin—See Cippolino, American.

Medjera Valley Quarries—See Numidian.

Medno-Rudiansk Mines—See Russian Malachite.

Medoux Gris (Breche)

Medoux Quarries, near Bagneres-de-Bigorre, Hautes-Pyrenees, France.

Yellowish-gray with fragments of black and occasionally one of white, gray, yellow or brown.

Medoux Quarries—See Breche Medoux and Medoux Gris.

Melana or Ink Marble

Name applied to Pentelic Blue.

Melene

Local name for the dark variety of Rose des Alps.

Melleo—See Giallo Antico Melleo.

Melleo Alabastro—Same as Alabastro Melleo.

Melleo Cupo Alabastro—Same as Alabastro Melleo Cupo.

Melleo Fiorito Alabastro—Same as Alabastro Melleo Fiorito.

Melleo Listato Alabastro—Same as Alabastro Melleo Listato.

Melleo Nuvolato Alabastro—Same as Alabastro Melleo Nuvolato.

Melleo Rossiccio Alabastro—Same as Alabastro Melleo Rossiccio.

Melos—See Bigio Morato and Lucullan.

Merbes-le-Chateau Marbles

Quarried in the neighborhood of Merbes-le-Chateau, Hainaut, Belgium.

Dark red with white veins. (Blagrove.)

Mergozza

Quarried near Mergozza, Italy.

White with gray veins. (Blagrove.)

Merlin Park Quarries—See Galway Black.

Messina or Messina Straits

Province of Calabria bordering on the Straits of Messina.

Marble is quarried.

See Agrillei Calderano and Torrevarata.

Metamorphism

The process, partly physical, partly chemical, by which a rock is altered in the molecular structure of its constituent minerals and frequently in the arrangement of its particles. If the cause of the process is a general crystal movement, the metamorphism is said to be regional or dynamic, but if its cause is mainly the contact with a molten intrusive rock it is called "contact metamorphism." (Vermont Geological Survey.)

Metamorphosed

A rock whose original form, shape or character has changed.

Metilin—See Marmor Lesbium.

Mexican Onyx

Quarried in various localities. The principal source for a great number of years has been the region southeast of Pueblo between Tecali, Tzicatacoya and Tepene, and perhaps for that reason this Onyx is often mentioned as being quarried at or near some one of the four places mentioned.

All of these marbles are generally known as Mexican Onyx, but are here listed under name of quarry. See Antiqua Salines, La Mesa, La Pedrara, La Sopresa and Magdaline.

All of the above excepting La Pedrara are producing.

Among the old quarries no longer producing are Agua Esconda, Desamparo, El Mogote Lajas, La Paoma, La Reforma, Tecoluco and Tepeyac.

Mezzotint—See Georgia marbles—Group A.
Quarried at Tate, Pickens County, Georgia.
White mottled with blackish markings.

Michigan Marble or Serpentine, or Michigan Verde Antique.
Quarry located at Ishpeming, Michigan.
Not producing.
Light green variegated.

Middlebury Cream Antique
Quarried at Brandon, Vermont.
Creamish-white, slightly variegated.
Not available.

Middlebury Pavonazzo or Cream Pavonazzo —Group C.
Quarried at Brandon, Vermont.
Creamish-white background with purple markings.
Not available.

Middleton
Middleton Quarries, near Queenstown, Cork County, Ireland.
Pink and gray with red and white veins. (Watson.)
Brownish-red with spots and veins of white and whitish-red. (Blagrove.)

Middleton Quarries (Ireland)—See Cork Red. Other marbles from this quarry in Cork County, Ireland, are pink, dove and sunset.

Middleton Quarries (England)—See Hopton Wood.

Middleton Red
Cork Red from the Middleton Quarries is sometimes called Middleton Red.

Miemo Marble
Alabaster quarried at Miemo, Tuscany, Italy, is sometimes called "Miemo Marble."

Miery (Lumachelle)
Quarried in the locality of Miery, near Poligny, Doubs, France.
Black with white fossils. (Blagrove.)

Migliarolo or Migliarolo Rosso
Quarried near Lake Maggiore, Italy.
This is a granite mottled red, gray, black, and white.

Migliarolo Bianco
From same locality is also a granite of white with black spots. (Blagrove.)

Milford
From the Milford Quarry, near Milford, Connecticut.
According to Professor C. U. Shepard, the above quarry was opened shortly after 1811 and operated for a number of years and then abandoned.
This same anthority describes the Milford marble as green and also mentions Verde Antique from the same quarry.

Milford Sound
On the west coast of South Island, New Zealand.
Marble occurs in great abundance. The only quarry in New Zealand of which we have a record is the one on Caswell Sound, an inner arm of Milford Sound. See Caswell.

Milton
One of the Champlain quarries.

Minnesota Marbles and Stones
See American Travertine, Kasota and Mankota Stone.

Mischi—Same as Pavonazzo, Italian.

Mischio—Mixed.

Mischio Breccia Serravezza—Same as Breccia Violetto.

The following marbles are all quarried in Italy and most of them are named after the location of their quarries:

Mischio di Serra Valle
Bluish-white mingled with gray, black and yellow.

Mischio di Marmaroja
Clear light gray.

Mischio di Volterra
Gray mingled with white and light red.

Mischio dei Conti
Pale gray with brown spots.

Mischio di Mitigliano
Pale red mixed with yellow.

Mischio Quarried in Brescia
Pink mingled with white.

Mischio di Siena (Tuscany)
Flesh colored mingled with white.

Mischio di Frosini
Quarried near the Abbey of St. Galgano. Reddish with white spots.

Mischio Verde or Verde Mischio
Quarried near Padua.
Green with black and white veins. (Blagrove.)

Miseglia—See Parmazo.

Missisquoi Quarries
At Phillipsburg, on the north shore of Lake Champlain, Province of Quebec, Canada.

Missisquoi Dark Gray off Regal
Semitransparent light green containing opaque fossils.

Missisquoi Emerald
White, almost covered with bright green veins.

Missisquoi Mottled
Light gray composed of an aggregation of coarse calcite crystals and slight indications of fossils.

Missisquoi New Layer
Somwhat lighter, otherwise the same as Missisquoi Mottled.

Missisquoi Regal
White with a few slender light green veins.

Missisquoi Regina
White with light clouded green veins.

Missisquoi Rex
White with slender light green veins.

Missisquoi Sea Green
White with closely set green veins, the color of which gradually diffuses with the white.

Missisquoi Vert Rose

Light green containing numerous white and rose colored patches.

Missouri Marbles—See Carthage marbles, Napoleon marbles, and St. Genevieve.

Missouri Onyx

This material is no longer available.

Mitigliano (Breccia)

Quarried near Mitigliano, Tuscany, Italy.
Yellow and gray with white and gray fragments.

For another marble quarried in this locality see Mischio di Mitigliano. (Blagrove.)

Mito Quarries—See Black and White (Japan).

Miyask

Amazonite or Amazon Stone was formerly almost exclusively obtained from near Miyask on the Ilmen Mountains, in the southern part of the Ural Range, Russia.

Mizzeh Athdar

Ibn-son-abed Quarries, near Jerusalem.
Delicate light primrose color, slightly mottled, with a few light pink patches.
Takes low polish.

Mizzeh Yahdar

Ta-la-bi-eli Quarries, near Jerusalem.
Pink to cream with occasional rose-pink veins.

Moate—See Irish Gray.

Mola

Mola Quarries, Alicante, Spain.
Light pink with white veins and a few thread-like markings of deep red. (Watson)

Molina

Quarried near Molina, Spain.
Yellow and white.

Molina Rosa

Garfagnana Quarries, Tuscany, Italy.
Pink and white with winding veins of dark reddish brown.

Mollinges—See Jaune Lamartine.

Molochites

Same as Malachite.

Mona Marble

Local name for Anglesey Serpentine.

Monastery Pentelic

Same as Pentelic White Statuary.

Moneyash Marbles

Quarried at Moneyash, Derbyshire, England.
Two kinds are quarried at this place. One is light mottled gray; the other is light mottled bluish gray. Neither is now being produced.

Monks Park Stone—Group A.

Corsham Down Stone from another quarry in the same locality. Quarried near Bath, Somersetshire, England.
Pale light brown or gray buff.

Mons—See Petit Granite.

Mons Claudianus Quarry

Located east by north of the ruins of Thebes in the mountains near the Red Sea.
See Claudian Stone.

Mons Porphyrites

Name of one of the Ancient Egyptian Porphyrites.

THROVGH THE AGES

VOL. 3 SEPTEMBER, 1925 NO. 5

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The marble front of the Franklin National Bank of Philadelphia.

THROVGH THE AGES

A Monthly Magazine devoted to the uses of Marble - its universal adaptability, beauty, permanency and economy.

VOL. 3 SEPTEMBER, 1925 NO. 5

THE FRANKLIN NATIONAL BANK

Travertine and Botticino Marble are Freely Used in this Philadelphia Building

TWENTY-FIVE years pass so rapidly that one would scarcely think a mere quarter century would be long enough to record the birth and growth to exceedingly strong maturity of a national bank in a city of more than century-old banking institutions. Such an evolution would hardly be possible in any other country but the United States; even in America it is an event worthy of notice.

Such a development has been effected in the career of the Franklin National Bank of Philadelphia. Starting with a capital of $1,000,000 in July of 1900, and having paid dividends a little over $2,000,000, it now has doubled its capital, and shows a surplus of nearly $5,000,000. This has been achieved without mergers or absorptions and for the past several years a dividend return to the shareholders of 20 per cent has been paid out of the earnings.

In 1904 the bank purchased the entire foreign business of the old house of Peter Wright and Sons, acquiring direct correspondence with all of the important cities of the world. The impetus thus acquired has never died down. It was only four years later that the Franklin bought and occupied the large office building at the corner of Broad and Chestnut Streets, at which time it was thought that such commodious quarters would suffice for a long time to come. However, these in turn were quickly outgrown and it was necessary, nine years later, to move into a new building on Chestnut Street west of Broad.

There seems to be prevalent a fixed notion that a street corner site is essential for a bank, a hotel, a drug store or a filling station. As a matter of fact, this holds true only for the last, and under certain conditions even this is not the case. Certainly the successful career and the location of the Franklin National Bank, situated as it is in the middle of a block, within hailing distance of a half dozen or more other banks, some of them respectfully aged and impressively substantial—and this in a city renowned for its conservatism—is complete refutation of any such idea.

McKim, Meade & White, of New York, and their affiliated concern, Furness, Evans & Co., of Philadelphia, were the architects. The building itself has a beauty of design

View of the main banking room from the Chestnut Street front. Travertine was used for a greater part of the walls; Botticino for the counters, and Vermont marbles for the floors.

and a completeness of equipment that account in part for the institution's growth. Even in a city so replete with beautiful structures, the distinctiveness of the columned front of the Franklin Bank attracts the attention of the passerby. The façade is of classic design, but there is also a subtle suggestion of the Colonial, a period aptly enough closely associated with the man whose name the institution bears. This suggestion is due to the recessing of the marble-paved portico, to the fenestration, and to the two fine marble pillars that extend 45 feet to the cornice, after the manner of the best American architecture of the eighteenth century. Such a banking entrance would be distinctive anywhere, and this one is fully as striking as a corner location could be.

The marble columns are topped by Corinthian capitals; to either side of these columns, at the corners of the building, are piers of marble that reach to the same height. The whole composition is crowned by a pediment whose apex is 90 feet above the sidewalk, but between this pediment

and the cornice are interposed three round arched windows filled with leaded panes and separated by Ionic pilasters. A feature of the pediment is the beautiful medallion of Benjamin Franklin, in low relief, above which floats the flag of the nation he so ably represented. The entire exterior of the building is white Georgia marble, and though now nearly ten years old, the material seems nearly new.

The recessed portico is two stories in height with square headed windows on the ground floor and arched windows above. The peculiar shape of the site, 54 by 230 feet, and its relation to the requirements of the bank presented a difficult problem that was solved by placing the entrance on the east side of the building where access is had to a public space about 18 feet wide and extending through the elevator hall of the adjoining office building on the rear.

The main banking room is Romanesque in style, and of the most unusual appearance. A high degree of originality has been shown in the design, not alone in the treatment of the side walls and in the arrangement of the ceiling of the long room, but in the unique effect obtained by the groined arches of the galleries at both the Chestnut and Sansom Street ends of the building. Each of these treatments is, in itself, commonplace enough; it is in the ensemble, the happy combination of all three in one composition, that one senses a touch of inspiration. Together they make this banking room stand apart from the usual, an architectural masterpiece that is as rare as the ability that created it.

Upon entering, the gallery at the Sansom Street end, directly opposite, is the first feature to catch the eye. Nineteen feet above the banking room floor level, it is seen through the arches of the south wall. The groined ceilings, shadowed by the light that enters through the three arched windows at the end of the room, are reminiscent of gray cloisters and mystic mediæval halls, and seem far removed from the prosaic purposes of a counting room. It is hard to realize that a part of the clerical force is installed in this gallery, and that another part has its quarters in a similar gallery at the Chestnut Street end of the building.

The north and south walls of the building above the gallery level are supported by columns and arches of Travertine; above the block type capitals of the middle columns are medallions and in the center of the wall space just under the curve of the roof is a finely carved coat-of-arms of the State of Pennsylvania, of large dimensions.

Around the side walls, the arch treatment is continued by means of flat pilasters; the medallions also appear in the spreadings above. Nothing but Travertine was used for the ends of the room. For the side walls, Travertine was used up to a height of 19 feet, where a molding runs around the entire room, and for the pilasters and all that portion of the upper walls above the arches.

The ceiling is arched and beautifully coffered, with the crown 68 feet above the floor. The floor is paved with alternate squares of black and white Vermont marble, a striking stretch of imposing richness. The banking screen is of Botticino marble, with bronze and circassian walnut woodwork for the upper portion. This marble is carried forward from the cages to the front of the room as a heavy parapet, separating the officers' space from the public corridor.

The directors' room, which stretches across the Chestnut Street front above the portico, is reached by an electric elevator from the banking room. It is ornamented with Formosa marble, the general spirit of the detail being that of the Colonial days.

The basement contains the big vault, 18

View of main banking room, looking toward the Chestnut Street front, showing gallery above the entrance-way.

by 27 feet in size, of Harveyized steel, and protected fully by the usual safety devices. This is reached by two elevators from the working space on the bank floor. The remainder of the basement is taken up with the book and filing vaults, locker rooms and engine equipment for the building.

Every modern appointment necessary for the comfort and health of the employees has been provided in this building and the working conditions are such that the daily operations of the bank can be carried on with the highest degree of efficiency and promptness.

Behind the bank is the office building referred to above, a structure 54 by 67 feet, located on the Sansom Street end, and this contains above the banking room fifteen stories of offices.

Above these offices are located the kitchen and dining-rooms for the bank and on the roof a recreation cage has been provided for the employees.

The tenants of the office building have access from Chestnut Street to their offices during banking hours through the main banking room, as well as from a direct entrance on Sansom Street.

It is interesting at this time to recall that the general arrangement of the offices in this big structure on the rear was considered so desirable that they were all leased before the building was completed, thereby establishing a record for the renting of offices in Philadelphia.

Sanitary

SOMETIMES one thinks of marble largely in terms of beauty and luxurious richness. Marble, however, possesses many other qualities that are far more practical.

Germ-proof and practically stainless, it is the ideal and economical material for walls, floors, and counters—especially in lunch rooms, soda fountains, and stores—and for bathrooms and kitchens.

THE HAMILTON COUNTY COURT HOUSE

Cincinnati Shows Progressiveness by Replacing Its Antiquated and Outgrown Hall of Justice

FOR a number of years previous to 1915 there had stood in Cincinnati a stone and brick building occupying a part of the block bounded by Main, South Court, Sycamore and South Canal Streets. This building, the old Hamilton County Court House, was representative of the late nineteenth century style of municipal architecture. Its heavily rusticated stone front ended in a series of quaint pointed balustrade ornaments and the square corners of the two lower stories changed to heavy round three-quarter columns, Normanesque in appearance. The sides were of brick, heavily fenestrated. The structure had all the aspects of a fortress rather than a place for the administration of justice.

Cincinnati was not particularly proud of its court house and plans were made to raze the old building and erect on the site a larger and more modern edifice that would reflect credit to the Ohio City. The New Court House Building Committee was appointed, with Mr. James A. Green as presi-

dent, and the selection of an architect was determined by a competition held in accordance with a program prepared by Dr. Warren P. Laird, of the University of Pennsylvania. This competition was held in 1913 and was won by Rankin, Kellog & Crane, of Philadelphia.

Actual work on the clearing of the site was begun early in 1915. The cornerstone was laid on October 1, 1915, by former President William Howard Taft, who was the orator of the day. The work proceeded under considerable difficulty owing to the World War, but was completed in 1919 and formally dedicated in October of that year. The orator upon this occasion was United States Senator Warren G. Harding of Ohio, later President of the United States.

The plan of the building consists of a large open square, 292 feet front by 260 feet deep, with a central wing from front to rear, forming two interior light courts open to the ground, each measuring 65 feet by 120 feet. The exterior is of stone, and the wall facing of the interior courts is of white glazed terra-cotta. The style is Italian Renaissance at its best. A flight of low steps runs the full width of the central wing, and from the sides of these steps extend parapets with heavy mouldings that bend and curve in an attractive manner around the corners of the pavilions at each end. The two lower floors appear on the front as one, and this portion contains six round arched doorways at equal intervals.

Beginning at the third floor level and extending through three stories is a colonnade of sixteen large pillars with Ionic capitals,

The old Hamilton County Court House, razed to make room for the fine new classic structure.

The main entrance hall with its walls and vaulting of Pink Tennessee marble.

by a great vaulted hall 30 feet wide by 186 feet long, opening directly from the street front and reached at each end through the stair and elevator halls. This entrance hall has a floor of Light Pink Tennessee marble tiles, with spots of Verde Antique. A border of Dark Pink Tennessee marble alternates with strips of Verde Antique and Tavernelle. The entire walls and ground vaulting is of Light Pink Tennessee with a rubbed surface.

supporting an architrave bearing the inscription:

"THE PURE AND WISE AND EQUAL ADMINISTRATION OF THE LAWS FORMS THE FIRST END AND BLESSING OF SOCIAL UNION."

Above the cornice is an attic with square-headed windows in pairs, and with the end pairs flanked by large seals of the state.

The pavilions at the corners of the building each contain two elevators and a stairway. The space between the pavilions across the front of the building on the first two floors is occupied

The columns between the hall and the public corridors are of polished green granite with caps of Tavernelle Claire marble, a granite moulded base and plinth and a sub-

A typical corridor on the upper floor.

plinth of Vermont Pink Lepanto. The marble work over the columns is Tavernelle Claire. In the floor of the entrance hall are three seals of bronze, the center that of the United States, the other two of the city and the county, set in an interlaced star of Dark Pink Tennessee marble with Verde Antique strips.

Directly back of the great hall is the lobby of the tax collector running the full length of the hall and opening directly from it. This arrangement provided ample space for the congregation and orderly alignment of the crowds of people during the rush of tax collection. The marble here is of Pink Lepanto and caps of Tavernelle Claire.

A typical stair and elevator hall of the upper floors. The wainscot and pilasters are of Light Cloud Vermont, the columns of Royal Antique, the plinths and base of Pink Lepanto, and the floor of Light Pink Tennessee marble.

The remainder of the first floor and the floor above is devoted to housing the county offices. The corner stair halls of the first floor have a wainscot and pilasters of Tavernelle Claire marble, and the former is carried up the first flight of stairs to the pilasters on the second floor separating the stairs from the hall. These stairs themselves are of Pink Tennessee, up to the fourth floor, and the marble is so laid as to be self-supporting, each step and landing of a single and perfect piece of marble. All of the exposed surfaces, including the soffit, have a honed finish. While self-supporting stairways present no structural difficulties, they require very careful and accurate work, with the treads and platforms fitted exactly into the slots provided in the wall and each thoroughly wedged in position.

The third floor contains eight large court-rooms, each two stories high, two on each of the street sides of the building. Between each pair of court rooms are the judges' and

juries' rooms on each of the two floors. The central wing on these floors is devoted to the Clerk of Courts and the County Prosecutor. All of the court rooms have marble wainscot and trim, two of them finished in Hauteville, two in Verde Antique, two in Edefels and the remainder in Tavernelle Claire. The rostrum fronts of these eight rooms, as well as the steps and risers, are of the same kind of marble as is used for the wainscot in the respective rooms, but relieved by inlays of contrasting colors.

The fifth floor contains eight main court rooms, the remaining space being given over to minor court purposes and minor county offices. The rostrum treatment in two of these rooms is the same as in the third floor courts, but the wainscot and trim is different, with White Alabama marble, Texas San Saba and Vermont Royal Antique being used.

The central wing on the sixth floor is taken up in its entirety by the Law Library, a vaulted room 54 feet wide by 120 feet long, with the book stacks adjoining this compartment at the rear of the front section of the building. The marble treatment here, which includes the wall facings, wainscot and pilasters, is altogether of Texas San Saba, with the exception of the column bases and plinths, which are Rosato.

The remainder of the sixth floor and the floor above is devoted to the jails for men and women, and to the Juvenile Detention Quarters.

The cost of the marble throughout the building was about $350,000 and when this sum is compared to the total cost of the structure, including all equipment, decoration, metal and wood furniture, which amounted to $2,750,000, it is seen at once that the showing made by the marble in the Hamilton County Court House is out of all proportion to its share of the entire sum expended. This fact becomes increasingly transparent when it is borne in mind that all of the halls, corridors and toilet rooms are finished in marble, and that even such portions as the subordinate stair halls, the jail kitchen, bakery partition and the like, contained quantities of this material.

Law Library, Hamilton County Court House. The wall facings, wainscot and pilasters are of San Saba marble.

Main floor rotunda, with its marble walls and floors.

THE MINNEAPOLIS INSTITUTE OF ARTS

A Building Made Possible by the Generosity of the Citizens of the Minnesota Municipality

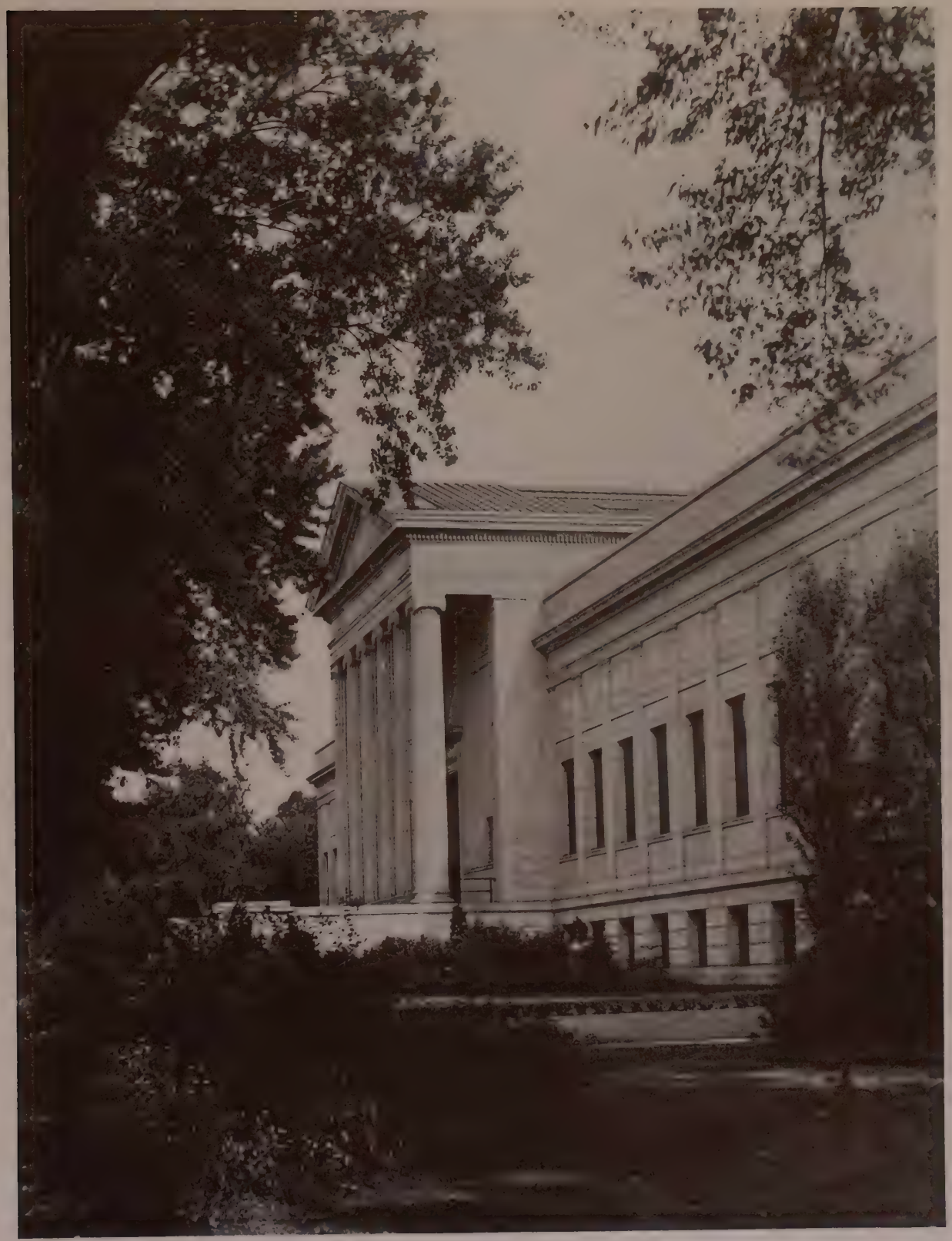
IN 1911 there was held a dinner in Minneapolis which was afterward to prove of epochal significance to the art lovers of the Minnesota city. At this dinner, held by the Minneapolis Society of Fine Arts, it was announced that Clinton Morrison had offered as a gift to the Society the ten-acre tract of land at Twenty-fourth Street, between Stevens and Third Avenues, with the proviso that $500,000 should be secured elsewhere for the erection of a museum. Not since the establishment of the Society in

View of the west corridor, main floor. On the right are the period rooms; on the left is the main stairway.

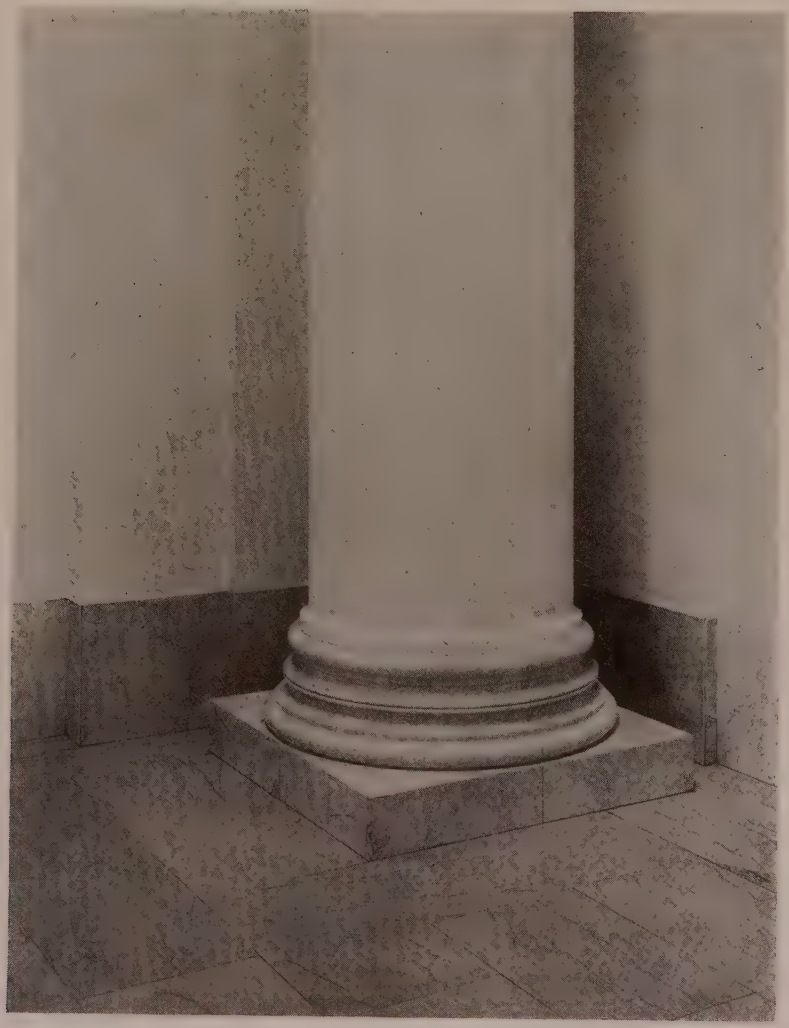
1883 had such an opportunity for expansion presented itself. The purpose of the organization—that of promoting a knowledge and love of art in the community—had only found accomplishment to the limited extent of the establishment of a school of art in 1886; this offer of land, therefore, opened up a way to larger activities. The President, William Hood Dunwoody, promised $100-000 for the building fund and $250,000 was pledged by other public-spirited citizens before the dinner was ended. In less than a month the entire stipulated sum for the building was obtained.

Thus was born the scheme for the erection of an art museum that was to exercise a considerable influence on American art. McKim, Mead and White, of New York, were appointed architects and the plans were prepared for a building that could be constructed in successive units, and which would eventually occupy the entire tract. The main unit was to consist of Museum, Art School and an Auditorium for the use of the Minneapolis Symphony Orchestra. The construction work on this portion was started in August of 1912 and completed late in 1914.

This section, which constitutes about one-seventh of the entire plan, cost $537,000. The design of the building is classical—a design that is restrained and refined in detail, and that depends for its successful effect upon the beauty of the proportions and simplicity of the lines. The length is about 325 feet and the width about 100 feet. The setting, the focal point of gracious shrub-lined walks, lends considerable interest to the structure. Trees of irregular silhouette add the necessary shadow contrasts and



The main façade, showing the towering pillars of the entrance portico.



Detail of floor, base and column treatment in main floor corridor.

accentuate the sheer beauty of the Ionic severity.

The main façade contains a columned portico whose six massive shafts tower even higher than the cornice of the lateral parts of the building. To either side of the portico, these wings extend in unbroken regularity, the main floor walls broken by square-headed windows set between pilasters that continue to the frieze course. Above each window, at the height of the second floor, is a square panel. These panels are the only outward indications of an actual upper story.

Upon entering the building, the visitor proceeds through a vestibule, where check room and information desk are located, into an octagonal hall. The walls of this entrance lobby as well as those of the main rotunda are finished in Italian Botticino marble. The floors are of Pink Tennessee.

Between each of the four openings of the rotunda are niches, and these contain casts of marble sculpture of the fifth century B.C., the Golden Age of Greece. In the center of this space is a large stone fountain of Italian origin and of the Renaissance period.

Leading to the left as one enters the rotunda is a long corridor containing casts of groups from the pediment of the Parthenon in Athens and reliefs from the same temple. At the far end of the vista is a reproduction of the celebrated Venus of Melos. The casts are so arranged that the visitor can trace the transition from the great periods of Greek art through the Hellenistic (represented by the Laocoön, the Boy and Goose, etc.) to the Roman, and finally to the Romanesque sculpture. The walls and floor of this corridor have the same marble treatment as in the rotunda—that is, Botticino and Tennessee respectively.

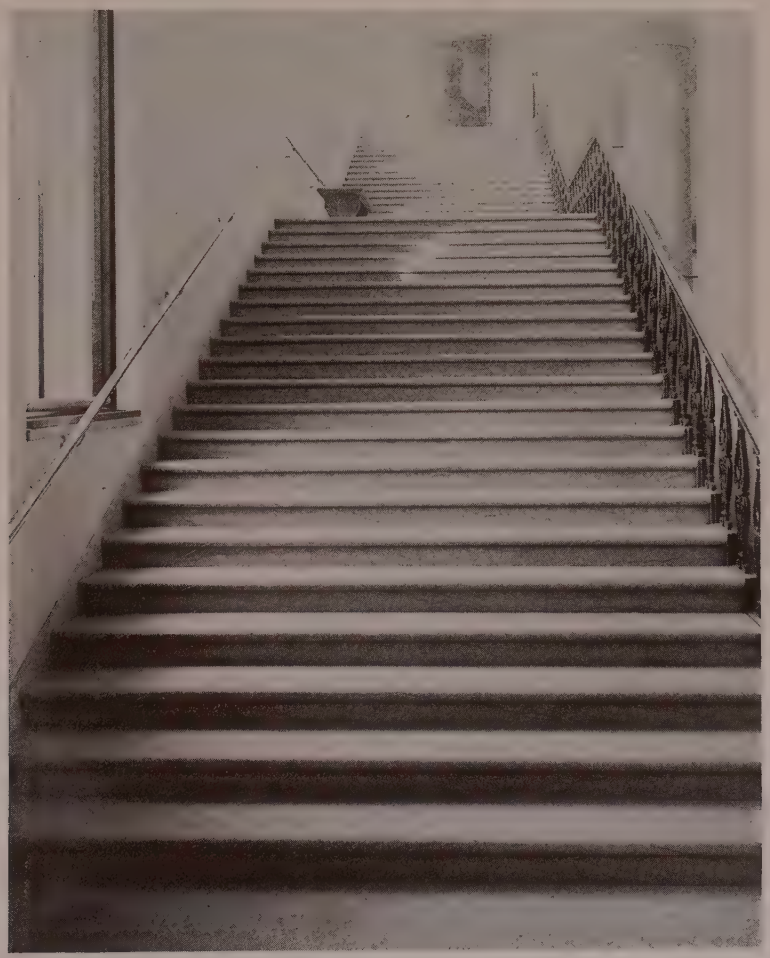
Opening off of the corridor are other rooms for special collections. Of these, the Egyptian gallery, with examples of art dating from about 2,000 B.C. to the Christian era, is of special interest. Mummies, coffins and scarabs from the tombs of important personages make up the larger part of

this exhibit. Chinese, Japanese and the art of the Near East have their special galleries in this east wing.

South of the rotunda are three rooms given over to Gothic, Italian Renaissance and Michelangelo sculptures, in the order mentioned.

To the west runs a corridor similar in design to the one on the east except that on one side ascends the main staircase leading to the second floor, of which particular mention will be made again further on. Original works of art arranged according to the period in which they were produced are found in a series of rooms to the north side of the corridors, from the Gothic of the twelfth century, through the Renaissance and Jacobean, to the American colonial, among them tapestries of the Martin collection, paintings by Vecchio and Moroni, an English Manor Mantel and a Duncan Phyfe table.

The stairway to the upper floor is separated from the corridor itself by a series of seven columns resting on bases of Italian Botticino marble, the same material that was used for the walls of the first floor main corridors and the wall bases on the second floor. The stairway itself has a width of 10 feet 5 inches and each of the treads is of one piece of Tennessee marble. Great care was exercised in selecting these pieces, not only on account of the required length, but be-



The stairway leading from the west corridor to the second floor is of Tennessee marble.

Corner of one of the four lavatories on the ground floor. These are all finished in English Vein marble.

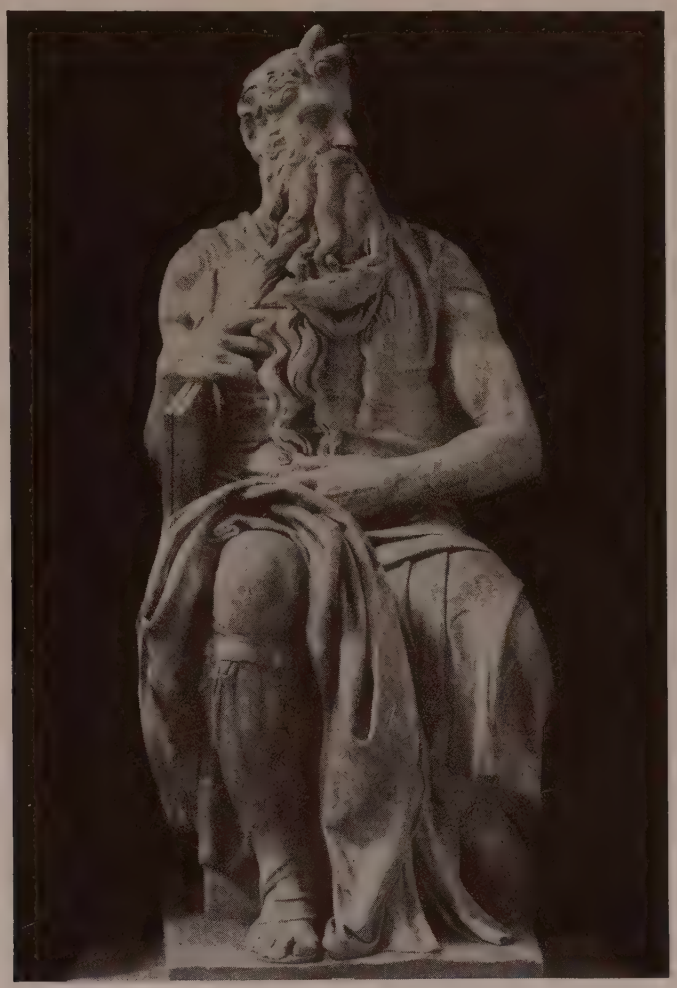
cause the architects were particularly insistent about securing uniformity in the general tone of the marble. This stairway ascends by two easy flights, a landing midway the top breaking the grade.

The second floor has been given over, generally speaking, to a display of nineteenth century and modern works of art. American, French and Japanese paintings are represented by very complete collections. One particularly interesting feature is an alcove where one may see an educational exhibition of the different methods of producing prints and the tools used in the process. Marble has not been used as extensively on this floor as on the floor below, its employment being confined mostly to the wall bases, radiator tops and window sills.

On the ground floor of the building are lecture rooms, the working offices of the institution, storerooms, a lunch room and spaces for shipping, repairing and the like. There are four lavatories on this floor which are finished to a height of about 8 feet in English Vein Italian marble, the only place throughout the entire structure where any marble other than Botticino and Tennessee has been used.

The policy of the Minneapolis Institute of Arts is to place an emphasis upon the utilization, rather than upon the mere collection, of examples of artistic enterprise. "In no way," said Mr. Joseph Breck, a former director of the Institute. "can a museum better the interests of modern art than by affording inspiration and instruction to those who design and execute the familiar objects which surround us in our daily life. No nation has ever produced great art which was not successful in the production of the decorative arts. Indeed, I would go so far as to say that great art is impossible when ugliness is rampant in the homes."

The maintenance of the Institute is provided by a city tax of ⅛ mill and contributions from the Society. For purchasing art works, there is available the income from an endowment of $1,000,000 given by William H. Dunwoody—a sum sufficient to assure a steady and healthy growth of the Minneapolis project.



Moses, one of the large figures for the Tomb of Julius II.

MICHELANGELO AND CELLINI

The Foremost Sculptor and the Most Gifted Goldsmith of the Renaissance in Italy

PART II

IN 1515 Michelangelo began the Julian Tomb and in the same year Pope Leo, who succeeded Julius to the Papacy, determined to finish the façade of San Lorenzo in Florence. He ordered Angelo to prepare a design and go to Florence to take charge of the work. For the next three years he lived at Carrara making roads and superintending the quarrying of marble, not only for the S. Lorenza front but for the Tomb, relying upon the Pope's promise that he would be able to go on with the latter. The Pope had been informed that in the mountains of Pietra Santa in the Florentine territory, there were marbles as good and as beautiful as at Carrara, so he ordered Angelo

Illustrations courtesy Thomas Machen, architect, Baltimore, Maryland.

Tomb of Giuliano de Medici, Duke of Nemours,
in the Sacristy of San Lorenzo.

to investigate them. These quarries are in the Alpi Apuane near Viareggio, and though the marble is of excellent quality, Angelo reported that it was unmanageable and unsuitable and that "even if it had been suitable, it would be a difficult and very expensive business to bring it down to the sea; for it would require a new road to be constructed for several miles over the mountains with pick-axes, and across the plains, which were very marshy, on piles."

In spite of this, the Pope ordered the road built and a vast quantity of the marble was brought to the coast. Among this were five columns of the right size, one of which was lying in the Piazza of San Lorenzo until 1889, when it was removed. The Marchese di Carrara, thinking Angelo to blame for the quarrying at Pietra Santa, became his enemy and forbade him ever returning to Carrara even for marble that he had already quarried.

Leo in 1520 cancelled the contract for the S. Lorenza façade, and began the new Sacristy, giving the commission to Michelangelo. Leo died in 1521, however, and this work was not finished until 1524, under Clement VII, another Medici Pope. In 1527, the Medici were expelled from Florence, Rome was pillaged and Angelo was called on

to design fortifications. In 1530 the Medici was restored, and the sculptor went back to his work on his beloved marbles.

To Clement VII came the idea of building a Sacristy in San Lorenzo in honor of the Medici family. "The whole building was designed by Michelangelo himself and was panelled to receive the sculptures, every architectural feature being planned to enhance the emotional effect of the great marble groups. In these, Michelangelo cast aside the pretty compliments upon which he had exercised his fancy when planning the vast Tomb of Julius II—the sorrowing arts and sciences, for instance. His aim was to create a perfectly beautiful resting place for the mighty dead. This, and nothing more." (Ernest H. Short: A History of Sculpture.)

These monuments in the Medici Chapel at Florence are perhaps the greatest works of Renaissance sculpture. They express more nearly all the mingled emotions and thoughts which human philosophy has tried in vain to unravel. "Michelangelo was never surer of anything than that sculptured marble was capable of expressing it all."

The first idea was for the tombs to be placed by themselves in the center of the Chapel, but a letter from Angelo shows that in 1524 it had already been decided to have mural monuments. The sarcophagi were to

Tomb of Lorenzo de Medici at Florence. "Twilight" is on the left; "Dawn" on the right.

support portrait statues of the Dukes and Popes, of Lorenzo and his brother Giuliano. At the foot were to be six rivers, two under each tomb—the Arno, Tiber, Metauro, Po, Taro and Ticino. In 1526 he had begun six figures, those that are now in the Chapel, and representing Giuliano, Lorenzo, Day and Night, and Dawn and Evening, The Madonna, perhaps Michelangelo's finest work in sculpture, was also carved by his own hand.

In 1535 Angelo finally left Florence, called to Rome by Clement VII; there he set to work at once to complete his contract for the Tomb of Julius. After the death of Clement, the new Pope Paul III appointed him chief architect at the Vatican, and the doors of the Sistine Chapel once more closed upon the master, not to be opened until 1541.

The Tomb of Julius was finally erected in San Pietro ad Vincula. The mighty design of the great sculptor's early years dwindled down to the Moses and the two female figures of contemplative Life and Active Life, seated at the right and left hand of Moses. "It is yet true," said Condivi, "that, although it is botched and patched up, it is the most worthy monument to be found in Rome, or, perhaps, anywhere else."

The figure is seated in an attitude of stern thought and wisdom. Under his right arm he holds the tables of law; the fingers of this hand are intertwined in the long waves of his beard, which depend to his lap, a most skillful bit of carving. His face is capable of inspiring both terror and love, a truthful representation of the leader and captain of the Hebrews. Upon his head are the two hornlike protuberances in accordance with the popular notions, and he is clothed in the biblical manner, with robes and sandals that leave bare the arms and part of the feet. Beneath the garments the form is apparent, and the shape and beauty of the body is

"Day," one of the two figures on The Sarcophagus of Giuliano, in San Lorenzo.

Details of the "Thinker"— the Tomb of Lorenzo, begun by Angelo in 1527.

almost marvelous. The statue is more than twice lifesize.

To the right of this figure, under a niche, is the statue of a woman representing Contemplative Life, with bent knee and face and hands raised heavenward. On the other side is Active Life, a woman with a mirror in her right hand and a garland of flowers in her left, the two signifying that our actions should be governed by forethought.

In 1547 the part of architect-in-chief at St. Peter's was conferred upon Michelangelo by Paul III and he began his work by pulling down much of Sangallo's construction. The Pope died in 1549 and his successor, Julius III, was also friendly to Angelo. Efforts were made by his opponents to supplant the sculptor from his post of architect to St. Peter's, and in a summary of grievances drawn up by the Superintendent and set before Julius III, it was stated that Michelangelo was "carrying on with a high hand, and letting them know nothing of the work, so that they do not like his ways, especially in what he keeps pulling down. The demolition has been, and today is, so great that all who witness it are moved to pity." (Gott.) The Pope was evidently satisfied with the sculptor, how-

ever, for he confirmed him in his position and even extended to him greater powers.

Continuous intrigues looking to the deposition of the aged artist were unfolded during the next ten years. In 1560, Angelo sent in his resignation, but Pius IV, the Pope at that time, persuaded him to remain in office and forbade any alteration of his design for St. Peter's. Michelangelo died in 1564, and his body was placed in Santa Croce, the Westminster Abbey of his city and the church of his ward.

Of the statues in the new Sacristy of San Lorenzo, at Florence, that of Giuliano is inferior by far to that of his brother, though both are perfectly finished. The neck is rather too long and the pose artificial. Criticism arises from the fact that though Giuliano had neither military capacity nor experience, he is shown clad as a Roman warrior. In extenuation of this, it may be said that these two figures cannot be regarded as portraits, but as symbols. The armor is splendidly designed and the model for this was probably a fine antique. The grotesque upon the breastplate is similar to one found upon an antique marble bust in the Naples Museum.

Beneath the figure of Giuliano are two figures above the sarcophagus, a man and a woman, signifying Day and Night. The unfinished head of Day is an example of how the master appeared to complete his work from the first stroke of the chisel. "The vigorous giant, just rising to work," says Holroyd, "looks over his shoulder at the bright sun. The rough chiselling of the face suggests already the dazzle of the light in his eyes; how he tears his right hand, as yet half stone, from out his stony breast"! The figure Night is expressive of the utmost sorrow, "so utterly absorbed in darkness and the shade of death, that to shake off that everlasting lethargy seems impossible. Yet she is not dead. If we raise our voices, she too will stretch her limbs, and, like her sister (Dawn), struggle into sensibility with sighs" (Symonds). Never has anyone given such pathetic beauty to the tired figure of a woman worn by labor and pain. Some

"La Pieta," in St. Peter's, Rome; the crowning work of Michelangelo's first Roman period.

authorities believe that Angelo intended Night to represent merely rest after labor, but it is rather the nightmare troubled sleep of a woman who has passed through many cares, and is burdened with many painful memories. These memories are symbolized in a strikingly eccentric mask, held in her left hand. The eyes of the mask are cut double; so that the expression changes as it is seen from various parts of the chapel. Worthy of mention is the owl in the bend of the knee of the figure, a creature of surprising power and dignity.

The statue of Lorenzo is easily one of the outstanding works of the world's greatest sculptor. Easy in pose, naturally balanced, the eye immediately is focused upon the wonderful helmet-shaded face, deep in thought. "What," writes Symonds, "occupies Lorenzo's brain? Bending forward, leaning his chin upon his wrist, placing the other hand upon his knee, on what does he forever ponder? The sight, as Rogers says, both 'fascinates and is intolerable.' Michelangelo has shot the beaver of the helmet forward on the forehead and bowed his head, so as to clothe the face in darkness. But behind the gloom there lurks no fleshless skull, as Rogers fancied. The whole frame of the powerful man is instinct with some imperious thought. Has he outlived his life and fallen upon everlasting contemplation? Is he brooding, injured and indignant, over his own doom, and the extinction of his race? Is he condemned to witness in immortal immobility the woes of Italy he helped to cause? Or has the sculptor symbolized in him the burden of that personality we carry with us in this life, and bear for ever when we wake into another world?"

Below this statue are the figures of Twilight and Dawn. The former, a muscular hard-worked man looks across the chapel as he lolls in relaxation after his day of toil. Dawn lifts her head, not yet clear of sleep, preparing for another day of pain and work. Her long, lithe limbs contrast with the brawny bulk of Night. "The muscular forms and the disposition of the lines are so beautiful and true that it is a veritable marvel and wonder of the world. The right proportion of development necessary for a figure of that colossal size to move and live has never been so well calculated. The head is so beautiful that it cannot be spoken about; but must be seen in the position Michelangelo designed it for, and not tilted upright on an ordinary pedestal as it is always seen in the art schools. All the four figures struggle with the trials, difficulties, and despair of their lives, as who should say, to such a pass has Medici rule reduced existence in Florence." (Holroyd.)

Michelangelo had left the works at San Lorenzo unfinished when he departed in 1535 for Rome. This accounts for much of the faulty and unfinished state of the Sacristy. The present sarcophagi never were intended, certainly, to hold the allegorical figures in the way they do, for the bases of the statues do not fit the top of the moldings. The rough stones that project over the moldings, forming a base for the feet, must have been intended to be supported by solid marble and not to extend uneasily into the air. The sarcophagi are a grayer marble than the figures, and the supports and lids are of a different marble from the material used for the actual receptacle of Lorenzo's body, that is under Dawn and Evening. The quiet moldings of this latter are much finer and more in keeping with the walls. "The lids are of a white sugary marble, the moldings course and semicircular in section, and the volutes and circular endings of the lids are of a perfectly stupid design. These lids cannot have been seen by Michelangelo; and, therefore, he cannot have seen the

View of the "Perseus" from the front. This is the most remarkable example of the skill of Benvenuto Cellini.

figures in their places upon them." Thus argues Holroyd, in his attempt to excuse the weaknesses of the designs. However, such was the worth of these various statues that they far overshadow and outweigh any architectural weaknesses, so that we may say with Condivi: "We owe thanks to Pope Clement for these masterpieces; and if he had done no other praiseworthy act in his life (but of course, he did many), this one was enough to cancel all his faults, for through him the world possesses these noble statues."

* * * *

Benvenuto Cellini had the misfortune to be skilled in the goldsmith's art at a time when the melting pot was frequently in demand. He achieved more fame as an author than as an artist and his ability as a sculptor was overshadowed by his genius as a metal worker.

Born in Florence in 1500, he early exhibited signs of becoming a musical prodigy, but in spite of his father's efforts to direct his early training with a view to a musical career, he persisted in pursuing the career towards which his inclinations drew him. At 14 he entered the workshop of Michele Brandini, whose son, Baccio Bandinelli, subsequently became Benvenuto's most bitter rival.

At 15 he was apprenticed to Giamberti; at 16 he was expelled from the city for brawling. Pope Clement VII procured his recall, and had him sent to Bologna, where he studied music. Six months later he was home. Then followed a quarrel with his brother, another exile from Florence and a career of adventure intermingled with periods of earnest work during which he executed some of the most astonishing articles of jewels and silver. Many of the works attributed to him are doubtful, including the Leda and the Swan, the car of Apollo, the Bargello rock-crystal gold-mounted vase, and various jugs, dishes, cups and platters.

Until he was past forty he attempted nothing in the way of sculpture. During his second visit to Paris in 1543 he began a scheme of decoration at Fontainebleau.

He describes the fountain in this scheme as follows: "... in the form of a perfect square with most beautiful flights of steps around it, which intersected one another, a thing that had never been seen in those parts (*i.e.*, France), and very rarely in these (*i.e.*, Italy). In the center of the said fountain I had set a base, which rose a little higher than the said basin of the fountain: upon this base I had placed a nude figure of very charming grace, of a size to correspond." Nothing of the scheme remains but the Nymph, once attributed to Jean Goujon, and now in the Louvre.

Upon his return from Paris, Cellini went

Profile of "Perseus," in the Loggia dei Lanzi.

Statue of Ganimede by Benvenuto Cellini,
now in the National Museum
at Florence

on with his modelling but his works showed a lack of training. His earliest, the bust of Cosimo I, in the Bargello, was an improvement on the Nymph, and the bust of Bindo Altoriti in Rome is of real merit.

In 1545 he begun for the Duke of Cosimo, the celebrated "Perseus and Medusa," one of the famous statues of the world, and in spite of its imperfections, one of the most attractive. His quarrels with Bandinelli only spurred him on to greater efforts in the construction of this statue, but it is odd that Cellini should have fallen into the same exuberance of muscular expression which he censored in his rival. This is noticeable especially in the over-developed shoulders and the exaggerated proportions of the lower torso and upper legs.

The Perseus stands by itself as a magnificent type of matchless beauty. The face is charming, the figure representative of calm strength, irresistible grace. The pedestal is sometimes criticized as over-ornate, with a tendency to divert attention from the figure it supports. Had the Perseus been carved in the Greek spirit, the criticism might be of importance; carved as it was in the flood-tide of the Renaissance period, the pedestal is in no way inappropriate as a base for Cellini's work, and the statue in no way suffers by the proximity of the ornamentation. This base is very generally admired even by those modern critics who are not altogether satisfied with the group as a whole, as a surpassing combination of the art of the architect, the sculptor and the goldsmith.

The Perseus relief in the Bargello, which was replaced by a copy in the Loggia, is not as successful. There are also in the Bargello two Ganymedes—one a bronze boy borne by an eagle; the other an antique restored by Cellini, both of which are fine examples of the artist's skill. He died in 1571.

THE IDAHO STATE CAPITOL

The Recently Completed Boise Building Bears a Resemblance to the National Capitol in Washington

THE United States has many buildings which are noted for their architecture and beauty. None of them surpasses in attractiveness, nor in the quality of construction, the State Capitol building at Boise, Idaho.

This building, which has only been completed within the last few years, was started in 1905. The time which it has taken to bring it to completion gives something of an idea of the immense task which has confronted both designer and contractor.

It was voted by the Legislature of 1905 to construct a Capitol and the carrying out of the task was left to a commission of prominent state leaders. These men traveled throughout the United States, inspecting municipal and government structures, comparing and compiling data, and getting ideas which might help in their work. The building, as it is today, is the result of their prolonged efforts.

The building was designed somewhat along the lines of the National Capitol,

The basement floor directly under the Rotunda, showing the elaborate pattern of variegated marbles, mostly domestic.

modified by the introduction of certain features taken from the great cathedrals of Europe.

It is constructed of stone from quarries about three miles from its site. *Illustrated Idaho*, in describing the building, says: "The building appears at close quarters as though carved out of a huge mountain of stone, which had been transported bodily from the nearby mountain to its present location."

Including the dome and carved eagle, the structure is 200 feet in height, and measures 320 feet by 180 feet at its base. From these sizes some idea of the great volume of material and work required to finish the exterior may be obtained.

Surmounting all is the great dome which is the crowning accomplishment of the building. This part of the design required a tremendous amount of study by the architects, but they solved the problem and the result is a dome which, while massive and strong, is not lacking in grace and true proportion; indeed it blends most effectively with the simplicity and beauty of the rest of the building.

The interior has been largely finished in marble, intelligently combined with wood and plaster. The marble, secured from the quarries of Vermont, was used for all the floors of the public rooms, and also for the walls. The wisdom of this has been shown, for the tiles of the floors in those parts of the building which were first opened to the public, show absolutely no wear in spite of the great throngs of people who have passed over them.

This work required 65,000 square feet of marble for tiles and panels, and 2,500 cubic feet of marble for columns and carvings. Altogether this makes a total of over 8,000 cubic feet of the material which was transported thousands of miles in order that nothing should be omitted which would tend to make the building more beautiful. A clearer conception of this quantity may be obtained if we state it in other terms: it would require a train of about 40 cars, each loaded to capacity, to contain the stone. In this lot of marble there were ten varieties. One of these was Florence Tile, which was used for the floors; another was Pittsford Italian, which was used for the treads of the stairways; still another—and this lot comprised a large amount—was Verde Antique and American Pavonazzo, for the walls.

The building is constructed in several units, the central unit, topped by the great dome, being complete in itself. These units are accessible by approaches entering from each of the four streets which encompass the site. These approaches end in beautiful, broad steps surmounted by high-columned porticos.

In the central part of the building is a magnificient rotunda 80 feet square, which derives its circular appearance from the double colonnade and the grand staircases in the four corners. The dome rises 150 feet above the top floor of the building and is supported by huge columns nearly 70 feet in height and 5 feet in diameter.

The basement floor beneath the rotunda has a star pattern surrounded by concentric circles formed of several varieties of marbles. Around the outer circle are four broad columns supporting an entablature ornately modeled and extending in a complete circle overhead. Above this is a balustrade, which, on the main floor, becomes the chief ornamental feature of this portion of the building.

Surrounding this balcony are circular galleries one above the other, supported on rows of marble columns, the first two tiers in the Doric style, and the third with the more ornate Corinthian capitals. Running

The Rotunda and main floor, Idaho State Capitol, at Boise.

A corner of the stairways, built completely of American marbles

from the main floor through the several stages and continuing to the base of the drum are other huge columns, which we have already mentioned above. The whole effect is strikingly rich, due as much to the marbles used as to the columnar design.

There are four floors in the building. The lower one contains the offices of those officials who require the largest amount of contact with the public. On the next floor are the executive offices, and on the third are the legislative offices and chambers. The fourth floor includes a gallery for the public, from which a view of the legislative chambers may be had; and it also contains rest rooms for the occupants of the building.

The grounds consist of a lot, 680 feet by 300 feet, containing over 4½ acres of land. This lot gives plenty of room for the approaches, which are beautifully curved; it is large enough, too, to provide an adequate setting for this building—and the builders have not failed to take advantage of it.

The designers of the Capitol were Tourtellote and Hummel. The work was under the direct supervision of Mr. Tourtellote. In producing the plans for this building, these architects have added to our wealth of beautiful structures, and have planned an edifice which will stand as a symbol of the ideals of the state and nation which made such a monument possible.

THE FEDERAL RESERVE BANK OF MINNEAPOLIS

The New Building is Completed at a Cost of More Than Two Million Dollars

CALLED by the press of the country "unique in the annals of bank architecture," the new home of the Federal Reserve Bank of Minneapolis is a worthy example of the skill of Cass Gilbert, of New York, and a fitting residence for an institution that is in one sense the corner-stone of the financial strength of the northwestern section of the country.

The site of the bank is a half block at the corner of Marquette Avenue and Fifth Street, occupied previous to 1919 by a furniture company and owned by Minneapolis and Grand Rapid interests. The cost of this lot, $600,000, was shared by the Federal Reserve and the Northwestern National Banks, and construction work was begun late in 1922. The foundation was built during that same winter, and the corner-stone laid on April 9, 1923, in the presence of representative business men of the district.

In spite of the extraordinary considerations given by both architect and contractor to the "strong box" features of structure which in this instance surpass the usual, there is not lacking a certain beauty and grace of line that is expected nowadays in a structure of this character. Symmetry of outline and harmony of design is attained to a nice degree, and though the treatment is somewhat bold, it never verges on the offensive.

The building is a steel framework with

Main entrance to the big banking room.

The expression "The Strength of Gibraltar" might be applied without exaggeration to the Minneapolis Federal Reserve Bank Building.

unusually heavy walls of stone. The appearance of tremendous strength is genuine. The sides, fronting 155 feet on Marquette Street and a parallel alley, actually have false walls or facings of stone and reinforced concrete and these in themselves are as thick as the walls of most banks. Burglars who manage to force their way through this barrier would find themselves poorly repaid for their efforts, for ahead of them would be the still more difficult task of breaking into the building proper. This impregnability is enhanced by the absence of all windows on the exterior of the structure to a height of about 50 feet, from which point the main body of the building continues upward for about 40 feet more, but set back behind the protective screen of the street walls. Though there are no false walls at front or rear, these portions are of such extra strength that a successful attack against them would be equally difficult unless aided by artillery or some similarly powerful agent.

The first impression of this strength is gained by a view of the front elevation, which occupies 165 feet on Fifth Street. Appropriately enough the architect has chosen the Roman motif, adopted to twentieth-century needs, to express his interpre-

tation of the unity of dignity and force. Eight massive columns with Corinthian capitals upholding an architrave of classic proportions, form an entrance portico. To either side the false walls extend for 15 feet, giving the appearance of side wings. Slightly projecting pilasters continue the order laterally. Above the denticulated bed-mould is the lion's head ornament of the cornice, similar to that used in the temple of Castor and Pollux (Dioscuri), erected by Augustus in the Forum.

The main opening to the interior of the bank is centrally placed, almost inconspicuous behind the middle columns and dwarfed by their far greater height. A handsome bronze door, ornamented with conventional designs in relief, is lowered by electricity during business hours, disappearing into a special crevice below the sidewalk level. Only one entrance door breaks the fortress-like exterior of the two protective side walls and this, located on the alley at the rear of the building, is designed primarily for the facile transfer of cash and bonds in armored motor trucks. It often happens that the institution's holding of gold, currency and negotiable securities exceeds $100,000,000 in value and it is for this reason that the directors of the bank attached such importance to securing burglar-proof construction. It is regarded as being as strong in this respect as any financial building in the world, not even excepting the famous Bank of England.

By having the walls of the building

Travertine is used for the floors; Tavernelle marble for the walls, counters, columns and tellers' cages, and as a floor border.

properly placed, as described above, about 15 feet inside the side street facings, there has been created a light well which allows daylight to enter the main banking room and penetrate every corner of the spacious compartment. This room, 15 feet above the ground or street floor is reached by way of a stairway that leads from the entrance foyer upward in two flights. The foyer walls are of Tavernelle marble and the floors are of Italian Travertine with borders of Tavernelle. The treads and risers are also of Italian Travertine, of thick stock.

At the right of the stairhead are the directors' room and the office of the chairman. At the left are the Governor's quarters. These rooms are conveniently arranged and richly furnished, suitable quarters for the heads of such an important institution.

The main banking room is handsome. In spite of a conspicuous lack of the elaborate ornamentation that one all too frequently finds, especially in buildings of a quasi-public character, there is a stately beauty that is entirely appropriate to the importance of the bank's affairs. Much of this beauty is dependent upon the imposing columns, the high coffered ceilings and the uninterrupted stretches of aisles and counters. As much, however, if not more, is due to the rich tones of the materials used. For here again, as in so many banking rooms built during the last few years, we find a happy choice of contrasting and yet harmonizing surfaces—the creamy brown smoothness of Tavernelle marble and the light tan coarseness of Travertine. The latter covers all the floor surface—vast expanses of stone selected both for its appearance and durability. The Tavernelle, an imported marble from Italy and known as Tavernelle Fleuri, is used in the walls, counters, columns and tellers' cages and as a border for the floor.

Above the soft sheen of the marble counters rises a rich screen of bronze grille, and these tellers' cages present an unbroken front across the banking room. To the right of the cages is the space occupied by the department of the Federal Reserve agents; to the left, adjoining the Governor's offices, are the quarters of the executives of the banking department.

The banking room, in addition to the flood of daylight from the well referred to previously, is indirectly lighted by an abundance of ceiling fixtures of graceful design, that shed a glow of soft light over the whole chamber and illuminate the stairway and entrance lobby.

On the floor above the main banking room are the workrooms of the bank, quiet and spacious. The transit department occupies most of this floor and because of the large number of adding and stamping machines required, it was necessary to construct the intervening ceilings of sound absorbing material to deaden the racket. This same sort of ceiling, in fact, was used in all the workrooms.

The third floor contains the auditing department's rooms, the bookkeeping quarters, the welfare department and hospital arrangements, women's rest rooms and a private restaurant, completely equipped with kitchen and lunch room, for the use of the bank's employees.

The men's club and lounging rooms, and a roof garden are located on the flat roof of the building, shielded from the sight of the people on the streets below by the protruding cornices of the main walls of the building.

The ground floor, which is entered through doors just to the rear of the main stairway, is partly given over to the Twin City Clearing House, for the exchange of checks between St. Paul and Minneapolis banks. The rest of this floor is occupied by the pur-

Stairway leading from ground floor to main banking room, Federal Reserve Bank of Minneapolis. The walls are Tavernelle; the treads are Travertine, of extra heavy material.

An uninterrupted vista of majestic marble.

chasing department and lavatories. In the latter, marble was almost the only surface material employed.

Below the street level are three basements, the first containing the vaults for storing the immense volume of records and documents, and a shooting gallery for the use of the guards and banking staff. The second basement houses the mechanical equipment, which includes an elaborate ventilating system and pumps for distributing water from the bank's private artesian well. In the lowest basement are installed the huge oil-burning furnaces, with each of the pieces of machinery installed in duplicate to avoid breakdowns in the system.

The vault equipment is almost a building in itself. Arranged in stories, with stairways leading from one floor to another, it is built of massive walls of steel and concrete. Fifteen-ton doors open into the main and street floors. The three-storied structure is supported upon concrete pillars extending to bedrock, many feet below the floor of the lowest basement. Beneath the vault floor is a space through which watchmen may walk, and, by means of a system of mirrors which permit a view of all of the six sides of the huge box at one time, guard against any attempt at dynamiting. The roof of the vault makes a sort of mezzanine floor of the main banking room.

A LIST OF THE WORLD'S MARBLES

By J. J. McClymont

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

Group A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

Group B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

Group C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

Group D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

Montagne Grise

Same as Djebel-er-Roos.

On this mountain are located the quarries producing Numidian marble from Algeria.

Montagne Grise Serpentine—See Algerian Serpentine.

Montagne Noire (Black Mountain)—See Languedoc.

Montague du Chateau

Same as Breche Montague du Chateau.

Montalato—See Tavernelle (Montalato).

Montalto Opal Brechi or Brechi Montalto Opal.

Quarried near Montalto, Lombardy, Italy.

Fragments of white and occasional fragments of yellowish red or brown held in place with a bluish white cement.

Montana

No marble of importance is being quarried in this state, and the only deposit known to us is one of Black and Yellow found in Lewis and Clark Counties.

Montarenti—See Siena Old Convent.

Montarenti Dark Siena—See Siena Dark Montarenti.

Montarenti Light Siena—See Siena Old Convent Silver Gray.

Montbart Breche

Quarried in Cote d'Or France.

Mottled with white, red, and yellow. (Blagrove.)

Monte Alcino

Italian Onyx is quarried in this Italian commune.

Monte Altissimo
Quarried near Seravezza, Italy.
Pure white. Like all Statuary marbles it is rarely obtainable in more than small sized pieces.

Monte Azuro
Quarried in Spain.
Sky-blue with clouds intermingled. (C. D. Jackson.)

Monte Claros
Quarried at Monte Claros, Spain.
Black with white veins.

Monte Corchia Statuary
This marble is mentioned by Blagrove as closely resembling the finest Italian Statuary.

Monte d'Arma (Breccia)—Group D.
Monte d'Arma Quarries, Italy.
Fragments of black limestone with a yellowish cement. This is inclined to break away in the process of dressing. (G. P. Merrill.)

Monte Ferrato—See Verde de Prato.

Monte Gazzo Onyx—See Alabastro del Gazzo.

Montel
Named after its quarry in Lot, France.
Blackish gray with green spots. (Blagrove.)

Monte Silvestro—See Bardilla.

Monthricaux
Named after the location of its quarry in Lot, France.
Black and Red. (Blagrove.)

Montmartin—See Brun de Montmartin.
There are also some Black and White marbles found at this place. (Blagrove.)

Montmirel
Quarried at Montmirel, Tarn, France.
Brown, gray and white. (Blagrove.)

Mt. Nębo Golden Travis—See Nebo Golden Travis.

Mount Pellegrino Onyx
Quarried at Mount Pellegrino, Corsica.
White with yellow and red veins.

Montrichoux
Quarried at Montrichoux, Tarn-et-Garonne, France.

Montrouge or Isabelle Marbles
Quarried at Montrouge, Seine, France.

Montville Serpentine
Quarried at Montville, New Jersey.
Deep green and oil yellow, often translucent. Only pieces of small size are obtainable, and though of exceptional beauty the stone has never been utilized, except for cabinet specimens. (G. P. Merrill.)

Monument
Same as Light Cloud Vermont.

Monyash—See Derby Fossil.

Morato
Blackberry color.

Morato ad Occhi
Same as Bigio Morato ad Occhi.

Morato Dorato
Same as Bigio Morato Dorato.

Morato e Nero Minuto
Same as Bigio Morato e Nero Minuto.

Morato Lumachellato
Same as Bigio Morato Lumachellato.

Morato Ondulato
Same as Bigio Morato Ondulato.

Morato Orbicolare
Same as Bigio Morato Orbicolare.

Morato Venato
Same as Bigio Morato Venato.

Moravian Serpentine
Quarried in Moravia, Silesia.

Moresque Brechi—See Brechi Moresque.

Morgon
Quarried at Le Morgon, near Gap, in the upper Alps.
Grayish brown, lightly spotted with gray. (Blagrove.)

Mori—See Giallo di Mori.

Morian—See Ohpite.

Moroccan Onyx—See Hadjadja Quarries.
Hadjadja Quarries, Morocco, produce Moroccan Onyx.
There are several varieties of this ornamental stone, including deep red, white with golden colored veins, and blue-gray with green ribboned veinings, while some varieties have a delicate pink semi-translucent shade dominating the mass. (Watson.)
Hadjadja is a small town near the Algegerian border.

Morra-bhandari
Near Morra-bhandari, in Jaipur, India, occur deposits of steatite (soapstone), which have been worked to some extent.

Mosaic Marble
Quarried at Moltifaeo, Corsica.
White filler cementing fragments of dark brown, gray, blue, yellow, and red. The brown fragments predominate.
Takes an unequal polish, and changes colors upon exposure. (Blagrove)

Mosca
Snow white.

Moscow
The vicinity of Moscow, Russia, according to Watson, yields rocks which, in some cases, admit a fairly good polish.
These are frequently utilized for decorative purposes.

Moss Green—See Verde Antico Medium.

Mottled Blue—See Holland Blue.

Moulin—See Verde Moulin.

Moulis—See Grand Deuil and Petit Deuil.

Mountain Dark—Group A.
Quarry at Shangrow, near Proctor, Vermont. Quarry abandoned.
Banded with alternating waves of dark gray to black and light bluish-gray.

Mountain of the Capes

Same as Djebel-er-Roos.

Mountain White—See Danby.

Mount Ku Hazar Onyx

Quarried at the base of this mountain (which is 14,550 feet in height and consists mainly, if not wholly, of volcanic rock) near Rayin, Persia.
Slightly greenish white.

Mount Lebanon—See Marmor Tirio.

Mount Lofty Range

Nearly all of the marbles of Australia are quarried on this mountain range.

Mount Marpesius

Modern Capresso—See Parian.

Mount Ocha

Modern Mount St. Elias (Ochal).
Cipollino Greek is quarried on this mountain, but inasmuch as there are not less than nine Mt. Elias in Greece, the above information is not definite.
Brindley places this quarry location on the west coast, a little north of Carystus, on Mt. Pyrgado.
Watson gives practically the same location, but does not give the name of the mountain.
At the approximate location given, there is one Mt. St. Elias (Ancient Ocha) which must be the mountain on which the quarry is located.

Mugnione Marbles—See Alberese di Mugnione, Caia di Mugnione, Cosuale di Mugnione, Giallo Liniato di Mugnione, Nuvoloso di Mugnione, Verde di Mugnione.

Mullion Cove

The Pengersick Quarries producing Cornish sepentine are located near Gew Graze, about midway between Lizard Point and Mullion Cove.

Muraz—See Vionnaz.

Murcía

Quarried in Murcia Province, Spain.
Red and yellow mottled.

Murphy—See Regal Blue.

Murrha

Same as Spato Fluore Antico.

Muscovite

Potash mica, the most common of the micas, generally of whitish to greenish color. Mainly a silicate of alumina and potash.

Mussel or Dog's Tooth.

One of the fossil marbles from Derbyshire, England.
Not available.

Myerstown

Quarried near Myerstown, Lebanon County, Pennsylvania.
Dove color with wavy black veinings and a few patches of white.

Myitkyina District Marbles—See Burmese Amber Jade, Burmese Blue Jade, Burmese Emerald Jade, and Burmese White Jade.

THROVGH THE AGES

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"Like some tall palm, the noiseless fabric sprung"

—BISHOP HEBER

The main banking room of the Guardian Savings and Trust Company of Cleveland, Ohio. Walker and Weeks were the architects. Marble from Georgia was freely used in this stately interior.

THROVGH THE AGES

A Monthly Magazine devoted to the uses of Marble - its universal adaptability, beauty, permanency and economy.

VOL. 3 OCTOBER, 1925 NO. 6

PLANNING BANK INTERIORS

The Reaction of the Public to Beauty Must Be Considered by Both Banker and Architect

THE problems that arise in connection with bank designing are being solved very happily in this country. It is not the purpose of this article to enter into a general discussion of these problems—such problems as, for instance, the proper height of the room, the relative disposition of the public and working spaces, the lighting, and the larger questions of its shape and style. Current technical literature treats of these things constantly and the architect will find all of these subjects amply discussed in the journals that reach his desk.

It is rather our purpose to touch upon a phase of bank planning which, while not entirely overlooked, yet receives all too frequently a scanty mention not fairly in keeping with its obvious importance. The special phase to which we refer is the study of the reaction of the public to beauty in a building—a reaction that must be considered by the banker as well as the architect. The psychology of the bank patron is not an indefinite, nebulous, complex theory, a something to be talked about in words of five syllables. It is, rather, a very well understood mental process which should be taken into consideration if the structure is to fulfill its highest destiny.

Harking back some quarter century ago, one remembers the dark and rather dingy banking rooms of our older cities in the east, particularly those of Philadelphia, New York, Baltimore and Boston. The general public had almost a feeling of depression when transacting business with one of these institutions. The officers were inaccessible and the provisions made for bank workers were sadly inadequate. The general air of mustiness and aloofness tended to repel the customer and certainly raised in his breast no feeling of personal satisfaction in his dealings with the bank.

Today all this is changed. Bankers are beginning to realize the value of a building that impresses the public mind with a sense of beauty and dignity. It is fairly obvious that such an impression is intimately associated with stability; it is equally obvious that the average person is filled with pride in having personal relations with such an institution.

Enough money is usually spent on the quarters of a modern bank to insure results

First National Bank, Tulsa, Oklahoma. Weary and Alford Co., architects.
A splendid example of an all-Tavernelle treatment.

that are not commonplace. The question that arises, then, is one of material and design. Mr. F. A. Fairbrother recently, in *The Architectural Forum*, answered this question as follows: "For the walls of a banking room of any pretensions, which implies a reasonable floor area and height, it is natural to consider first marble or stone because of their appearance of strength and the pleasing textures which may be obtained by their use. If care is exercised in the selection of the marble, and if too much elaborate veining is not allowed to confuse the surface and destroy its dignity, it seems that no better material can be found. It is durable without a doubt, its color can be so selected that the surfaces are not tiresome to look at, and it can be kept clean without great difficulty. A fine hone finish will lessen the shine and glints of light which are present where the surface is polished and will give a soft, even wall surface which is pleasing to the eye.

"Where marbles of rich veining and pronounced color are used they should be placed with care and their use made to count strongly in the design. In the banking room of the New York Trust Company on Broadway the richly veined columns of reddish-purple with bronze capitals contrast strongly with the simpler colored marble on the walls. A highly veined and colored marble on the walls would have impaired the appearance of the room.

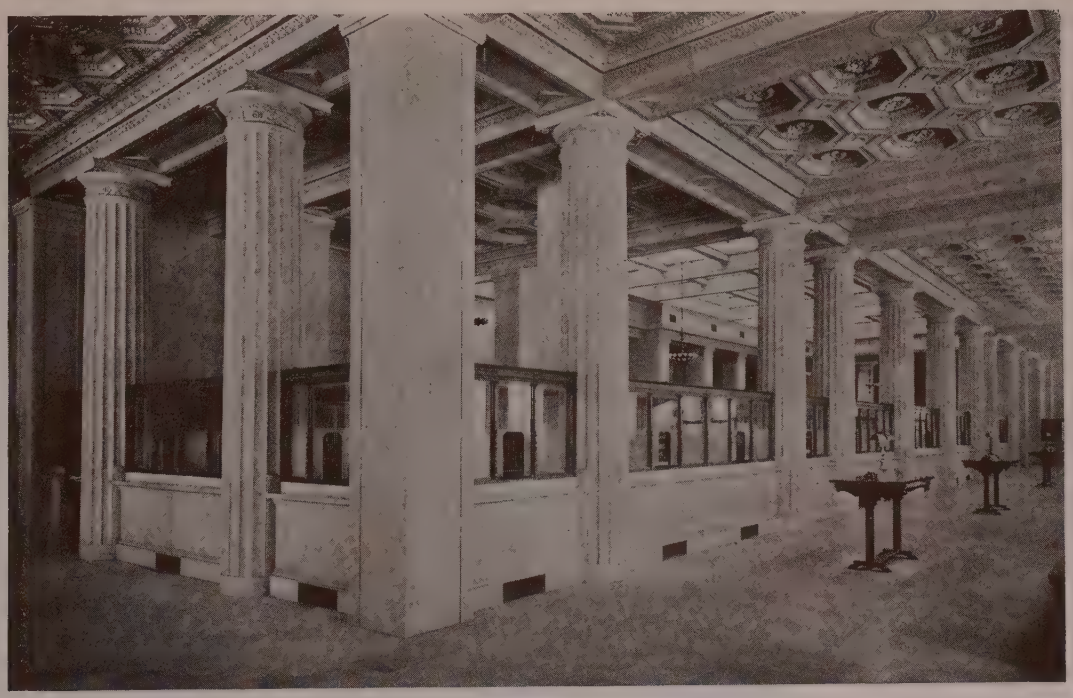
* * * * *

"The counter screen is the portion of the banking establishment with which the public comes in closest contact, and is probably examined with a more critical eye than any other portion. Because its position is near the eye, and also because of the time one is often compelled to spend in line at a teller's

wicket, the screen attracts close attention. For this reason it should be of material and workmanship which will bear close inspection. Examples of all possible arrangements of counter screens may be seen in the banks of almost any city. If we examine them all we shall doubtless find that bronze is generally used for the upper parts of the screens with marble in the lower parts. Next in number we shall probably find counter screens with marble below the counter line and marble pilasters and cornices above, with small metal frames or mouldings to hold the glass. We shall also find a few examples of iron used for the upper parts, and some where wood is used for the whole screen. There is not much question but that marble is the most suitable material for the portions of the screen below the level of the counter; neither is there much doubt that bronze is the best material for the upper portions of the screen.

"It is important that the floors of the banking room be well considered in selecting the materials of which they are to be made. Not only are the surfaces subject to severe wear, but in the public portions they may have to bear the added test of being frequently tracked over with muddy footsteps and spotted with water from dripping umbrellas. In the private or working portions of the bank the surface must also, in addition to the normal walking about of employees, stand the wear incident to the trundling around of book or file busses.

"For the public portions of the banking room it is fitting that the floor be made part of the design of the room. The material, of course, does not need to be especially suited to foot comfort or quietness. For purposes of design as well as for wear, marble or stone is most desirable. Marble can be found in suitable colors and tones to secure almost any desired result. For general



National City Bank, New York City. McKim, Meade & White, architects.
The marbles used were Botticino, Travertine and Tennessee.

The interior of the Broadway Trust and Savings Bank, in Chicago. The Breche Violette and Black and Gold marbles in the counters and piers are toned down by the Tennessee floor. The marble around the doors is an effective touch.

In the Cleveland Trust Branch Bank, Cleveland, this combination of Madre-Veined Alabama and Verde Antique proved very attractive. A. G. Hall was the architect.

The use of Verde Antique marble in such quantities as this for screen and pilasters is most unusual. Hoggson Brothers, the architects of the Institution of Savings, Springfield, Massachusetts, have achieved a notable success in this interior.

Holmes and Winslow, the architects of the Homestead Bank, Brooklyn, New York, used Napoleon Gray marble exclusively for this quiet treatment.

The National Bank of Commerce, Providence, R.I. Stone, Carpenter & Sheldon, architects. Vermont marbles—Verdosa, Brocadillo, Marine Brocadillo and White Rutland inlays—were specified here.

The Federal Reserve Bank of Atlanta, Ga. A. Ten Eyck Brown, architect. Alabama marble was used for columns, screen, balustrades, wall and floor.

Not all banks need be as ornate as the American Bond and Mortgage Co. of New York. Hauteville, Black and Gold, and Pink and Gray Tennessee were used. C. Howard Crane, architect.

wearing qualities, the best is probably the hard, gray varieties with very little veining. The gray Tennessee is very largely used, and in color and tone gives a desirable surface, lending itself well to combinations with other marbles. The gray is somewhat easier to keep clean than white, and is more restful to the eye. Marble of other colors is often used in forming borders and patterns. The problem in such cases is to find marbles having the imperfections which we call veinings of the proper colors and tone, and at the same time of sufficient hardness to wear evenly with the fields. Some of the heavily veined marbles are rather soft in character, and would not give satisfactory service where subjected to wear from thousands of feet. There are, however, several kinds of marble suitable for service on floors and still of pleasing colors, so that almost any desired combination may be obtained.

"Foreign marbles have been most extensively used where decorative effect has been desired, but there are many domestic marbles which can be used to advantage and which will give excellent results."

A combination of marble and Travertine has of late enjoyed quite a vogue. Travertine, while not literally a marble, is considered as such by the trade. It has a history that goes back for hundreds of years. Known

by the ancients as Sapis Tiburtinus, it was quarried at Tivoli, from del Barco, and was used in the Temple of Fortuna Virilis, the Appian Way, the Servian Wall, the Colosseum and, later, in the external walls of a great many of the churches of Rome. It is a very porous calcareous deposit which hardens under exposure, with a surface of spongy appearance but of exceeding durability. Usually white or cream color, it can be employed most effectively for stairs, ramps and flooring.

Another material that lends itself to interesting color schemes is marble mosaic. The cost is less than marble and the general appearance is very satisfactory though not as dignified nor impressive as the solid material. It has been used freely with good results both within buildings and in the open, and without confinement to any particular mode of architectural expression. Since the chief function of such a pavement is to lend texture and life to the structural composition of which it forms a part, it is often laid with patterns that supply spots of color that attract the eye. The fact that such mosaic wears very well is an economic factor that deserves consideration.

Another floor surface that is only slightly less costly than either marble or mosaic is Terrazzo, a mixture of marble chips and cement. When properly made it contains relatively coarse pieces of marble, such as pass a ¾-inch or 1-inch ring, mixed with enough finer material to fill the spaces between the larger fragments. When Terrazzo is made entirely of the smaller sizes, the surface will soon wear unevenly, due to some of the pieces of marble being torn loose from the floor.

In a later number of THROVGH THE AGES, there will be an article giving additional information about stone pavements, with a few illustrations of their use.

A marble mosaic floor in the National City Bank, Salt Lake City, Utah; W. Moore, architect. Tokeen Alaska marble was used for the screen, with a Verde Antique base.

"Carrying Coals to Newcastle"

THAT American marbles are the equal of any in the world is strikingly evidenced by the fact that "The Boy of the Piave," the monument pictured above—which is to be erected in Rome on the Pincian Hill—will be built entirely of marble from the United States.

THE WASHINGTON PARK NATIONAL BANK

A Chicago South Side Institution That Offers a Unique Marble Treatment

IT is a distinctive human trait that the story of a success should be absorbingly interesting. Perhaps it is because the spark of ambition burns in every breast, and the tale of another's achievement pricks the imagination and fans the spark to brighter glow.

The history of the Washington Park National Bank is such a story. "Total resources of over eleven million dollars"—these words, used to describe the financial condition of the institution, coldly indicate its present strength and stability; they do not reveal the actual facts behind the figures, the record of continuous adherence to certain ideals of safe and conservative banking that made the figures possible.

Founded in June, 1907, it had assets of $25,000 and a firm belief in the future of Chicago's great South Side. It was not by chance that this private bank was located near the corner of 63rd Street and Cottage Grove Avenue; it was foresight that realized this intersection was the hub of a wheel of population that was destined to increase in area and density as the years went by. The soundness of this judgment was shortly confirmed. The Washington Park Race Track, famous among turfmen of a generation ago, gave way to modern buildings. Old struc-

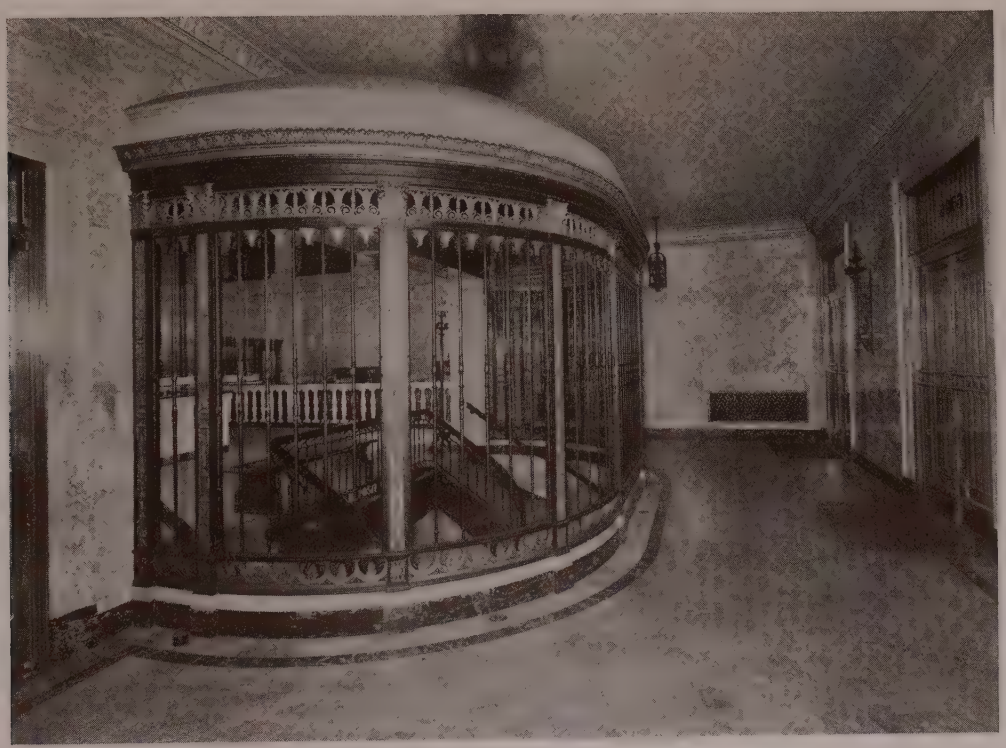
tures were torn down and replaced with new and modern buildings. Homes and stores arose where before footpaths stretched across vacant lots. Hotels, theaters and apartments, stately boulevards and spacious parks appeared. The spirit that was to make Chicago one of the greatest cities in the world was magically at work on the South Side.

The Washington Park Bank prospered from the beginning. A little less than two years after its inception, it secured a national charter and moved to a new building at the corner of 63rd Street and Evans Avenue, and added the word "National" to its name. The new building seemed at the time a notable example of monumental bank architecture, and easily capable of accommodating a crowd in its great lobby. Here, it was thought, the bank could do business for an almost unlimited number of years.

Time is the great enlightener. The original clientele of 500 increased far faster than anticipated by even the most sanguine. When the number approached 30,000 it was seen that only an even more massive home could care for the stream of patrons that flowed daily in and out of the banking room. Arrangements were made in 1923 for the present building, and the lot at Cottage Grove Avenue and 63rd Street acquired.

Mr. Albert A. Schwartz, of Chicago, was the architect of the new home of the Washington Park National Bank. It is a four-story building of fireproof steel and concrete construction. Its exterior is marked by the simplicity of the Roman style of architecture. Four pilasters extending from the second floor level to the frieze distinguish that portion of the façade that contains the entrance to the banking quarters. The remainder of the building is given over to stores and offices.

Entering the building through one of its



The entrance lobby gives a foretaste of the richness within.

General view of the banking room looking toward the main entrance. Most of the marble is Old Convent Siena.

three broad doors, one comes into a foyer of remarkable beauty. From the floor to within a few inches of the ceiling the walls of this foyer are marble. Gray and yellow mixed Old Convent Siena was chosen, on account of its soft colors and striking veining. The floor is of the same material. The base is of Black and Gold marble and a small line border of Black and Gold is set in the floor about a foot from the edges. A circular grill of wrought iron, which screens the stairway leading from the main lobby to the vault floor below, is decorated in a design that continues and elaborates upon the motif contained in the cornices.

Passing into the main banking room, two impressions are immediately predominant. One is that the architect was not hampered by space limitations—that he took full advantage of the dimensions allotted to this portion of the structure. A lofty coffered ceiling, in which is set a large skylight of cathedral glass bordered by a wide, flowing design of conventionalized oak leaves, sheds a flood of light over the spacious quarters below. To the right, high above the tellers' cages, a mezzanine floor is half hidden by seven square columns with ornate capitals; to the left, the counterpart of these columns is found in the pilasters of the wall, their bases resting on a frieze scroll that is carried completely around the room.

In front is another mezzanine, the wall opening only partly filled by a low graceful

A corner of the banking room looking toward the rear, showing in the foreground the marble inclosure where new accounts are opened.

Entrance to the vaults in the basement. Black marble benches contrast with the lighter tone of the Siena marbles.

metal railing; a background of three wide windows richly draped adds to the sense of spaciousness.

The second impression is that of regal grandeur. In spite of the practical uses to which this room is put, evidences of which are naturally apparent, the beauty and dignity of its appearance almost conceal its utilitarian purposes. Stretching ahead is a splendidly gleaming marble floor, with a bewildering variety of rich tawny colors like a rare oriental rug done in stone. To either side the counters continue the scheme upwards some three or four feet, the only breaks in the continuity of color occurring at the juncture of floor and counter, and in the floor border strip close by.

The material employed is Gray and Yellow mixed Old Convent Siena, with the base and strip above mentioned of Black and Gold—the same marble treatment as in the foyer and one that is very unusual. There is, in fact, no other building in the middle western section of the country, as far as can be ascertained, that has a similar treatment; this renders the room all the more striking.

On the floor below the main banking room are the investment department, the rest rooms and the safe deposit vaults. A stairway from the foyer leads to this floor, and here, too, Old Convent Siena was chosen as the floor material and for the treads and risers of the stairs. The vaults, notable for their size and impregnability, are entered by a short flight of two broad marble steps. To each side of this entrance are marble benches of Black Belgian, with bases of the Black and Gold marble that appears again in the floor border and wall bases. The contrast of this brown-veined ebony material with the yellowish gray of the floor surface is most pleasing and is only faintly indicated by the illustration on this page. The addition of green growing plants, both here and on the mezzanine floors of the main banking room, is a touch of decorative intelligence that could be profitably copied by other institutions.

THE MARBLE BUSINESS--

A Southern Industry

By COLONEL JOHN STEPHEN SEWELL

(Courtesy *The Southern Banker*)

IT took a long time to build up the necessary organizations of skilled workmen in the marble industry of the South, but it has been done. The time is long past when anyone could fairly question the ability of the southern marble shops to turn out any sort of work, no matter how difficult it might be. Most of the skilled workmen are natives of the South, so this industry is one of the many that have demonstrated that there is no lack of innate mechanical ability among them. All they need is a chance.

When the South, as a whole, awakes to the value of a large and well-paid industrial population consuming locally the local agricultural products, we will be in a way to assist the southern farmer to a degree that lies beyond the power of Congress or of any other agency extraneous to ourselves; but it will involve the abandonment of many deep-seated and time-honored prejudices on economic questions—especially the tariff.

There is one feature about the marble trade—more especially the interior marble trade—that should be of interest to bankers under modern conditions: It requires about a year to complete a large building from the time the old structures, if any, begin to be torn down. It has come to be a sort of unwritten law that not more than one year's rental shall be sacrificed to the exigencies of construction work.

To accomplish this, and to do in one year what used to require five or six, not only are new structural designs and methods necessary (like the steel skeleton building as compared with the old type in which the walls carried the structure instead of being carried by it), but contracts for all essential parts of the building must be closed and work must begin on the necessary materials as soon as the builder himself begins to tear down the old buildings. In the case of the interior marble, nothing that goes into the building is more important, if serious delays at the finish are to be avoided.

Inasmuch as the interior marble is almost the last thing that goes into place, this results in giving to this trade, as compared with business in general, a "lagging phase" in its periods of prosperity and depression. An oncoming commercial depression finds many buildings under way, with contracts signed and sealed, for everything that goes into them. Very rarely is work suspended on any of them. These contracts generally carry the interior marble trade through the first year of the depression on such a basis that it is often, for them, the best year of the entire cycle. They are running to capacity, money is coming in, no new contracts are being started, so that their working capital rapidly turns into cash. If they are accustomed to borrow from the banks, they pay up in full during the first year of a depression if they never do it at any other time.

On the other hand, the unfilled orders on their books rapidly diminish, and the same causes that make the first year of a general depression their best year, will generally cause the first year of a general recovery to be their worst. However, this condition is nearly always mitigated by a very consider-

able increase in small orders, which begins before the large contracts are all filled. Just why this should be so is not always clear—it is a fact of observation.

The net result is that the interior marble trade never quite attains the utmost peak of prosperity, as compared with other trades but neither does it reach the utmost depths of stagnation. Its highest peak of prosperity coincides with the lowest depths in general business, so it tends to equalize and stabilize the general situation.

It is not extensive enough to have much effect in smoothing out the fluctuations in the curve of general business conditions—but the tendency is there—and it should make of any well-managed interior marble concern a very desirable banking risk, for it should be putting cash into the bank at times when many other lines are in need of additional credit.

Wherever marble was available, civilized man of every race and clime has used it for his monuments and most important structures.

Marble is crystalline limestone; it may be either calcite or dolomitic. In the first case, it is the result of the crystallization of a pure limestone, properly so called; in the second, it is the result of the crystallization of a magnesian limestone.

So-called Verde Antique marble is, properly speaking, not marble at all, but serpentine with generally some calcite veins or clouding in it. Verde Antique is the name given to only some of the stones which are in the same class with it, and as many of them are used under other names—as Levanto—it would be better, for a generic name, to adopt that used by mineralogists which is Ophiolyte, or Ophicalcite or simply Serpentine. "Verde Antique" is properly applied to the varieties with a ground tone of green—but many serpentinous marbles are red, purple, or nearly black, or mixtures of all of these. However, the main point is that when these stones are reasonably sound and take a good polish, they are used for many of the same purposes as marble, more especially for decorative interior finish of buildings. The marble trade has classed them as marbles. Any other stone with

A typical Southern marble quarry.

similar properties and adapted to the same uses would, no doubt, soon come to be classed, commercially, with the marbles, regardless of its mineralogical classification.

The white calcite marbles, when completely crystalline, *i.e.*, when they consist of a mass of interlocking crystals of calcite (calcium carbonate) with no open spaces and no non-crystalline material between them, are the marbles par excellence, and are adapted to a greater variety of uses than any others. They are obtainable in sound blocks, they are durable, not difficult to work, they are impervious, and they will take any sort of polish from a dull gloss to a brilliant lustre. When fine grained, the most delicate carvings can be executed in them to perfection. When nearly pure white and of the finest texture, they are used for statuary and similar purposes. There is very little real statuary marble anywhere in the world.

The great majority of white marbles contain more or less veining and clouding and exhibit some variations in the tone of the ground mass. When the material is skillfully handled, it presents all the advantages of a pure white material and its natural variations save it from mechanical uniformity. The veining and clouding in what are ordinarily known as white marbles are generally of some shade of gray. There are white marbles which have veins and clouds of rich and brilliant colors, or which have been broken to pieces by earth movements and then reunited by the action of ground waters containing rich and brilliant coloring matters, but these always have special names of their own—Italian Pavonazzo and Breche Violette, for example—and are classed by the trade as fancy marbles. They are not always sound, require some filling and patching and are properly used for decorative purposes where a rich and splendid color scheme is desired, in addition to perfection of tone and texture.

There are other marbles with a ground tone of some shade of buff, gray, tan, pink, or brown, or a mixture of these. The names of these colors, however, may wholly fail to convey any accurate idea of the appearance of the marbles to which they are applied. Marbles rarely exhibit colors which even approximate any pure prismatic color. To know what is meant by pink Tennessee, one must see it; the same is true of the gray marble produced in the same locality. Even the purest of the gray Tennessee marbles have a suggestion of pink in the ground tone, and the pink ones have a suggestion of brown. In all of the marbles now being discussed, the dominant color is exhibited in a neutral shade.

For this reason, probably, they have been classed as monotones, although the ground mass is never even approximately uniform in color and shade. The variations are on such a small scale, however, that the general effect is probably as well described by the word Monotone, as any other that is available.

There are marbles that are black or bluish black. Sometimes they have white or yellow veins or spots in them. The blue-black marbles are not as attractive as those in which the black is like India ink, or, if diluted, would be brown. Most of the black marbles are dolomitic. White dolomites rarely take a good polish, but the black ones nearly always do.

There are marbles in which the ground mass is red, or yellow, or greenish yellow; but they are rather rare. Nearly all of them contain veins, clouds or spots of a different shade or color from the ground mass. They are all classified by the trade as fancy marbles.

The above brief descriptions fall far short of covering, even in general classes, all the

marbles available in the markets of the world. There are hundreds of kinds of marble, each quite individual and distinct from all others. For every color scheme that can be imagined, there are marbles that are appropriate. At the present time, they are produced in Europe, Africa, North and South America; they are known to exist in Asia, where they were largely used by the Hindoos. Beyond doubt, they are to be found in all large areas where mountain-building by deformation of the earth's crust has ever prevailed.

The marble trade in the United States has never, until recently, done any general advertising at all. Within the last few years, some concerns have done a little; within less than two years, the principal association in the trade has made a beginning—a very good one—but still only a beginning. Of course, everyone in the trade has tried to reach special and limited classes of customers, but practically nothing in the way of information has been disseminated among the general public. It is therefore not surprising that few average citizens know anything about marble at all.

In particular, the public in the South is not generally aware of the extent and importance of this industry in their part of the country. Unless conditions have changed recently, Vermont is still the leading state in the production of marble, and is the home state of the largest marble company that has ever existed. But the South, as a whole, probably produces more than 50 per cent of all the marble produced in the United States.

Marble is produced at the present time in the southern states of Alabama, Georgia, Missouri, North Carolina and Tennessee. It has been produced in Arizona, New Mexico, Oklahoma and Texas. Maryland has been an important marble-producing state and will probably become so again.

Further discussion of marbles will be confined chiefly to the varieties produced in those states where the industry is of commercial importance at the present time.

ALABAMA

There is a belt of white marble extending in a general northeast and southwest direction through Talladega County, Alabama. The marble is fine-grained, completely crystalline, with a ground mass which is of a warm creamy white. Sometimes it turns blue or has blue streaks through it, but the blue marble forms, at most places, only a small part of the deposit. The deposit is nearly always found under the floor of what is known as the Marble Valley, at a depth ranging from 10 or 15 to 50 feet or more. In a few cases, isolated "fault blocks" are found cropping out on the sides of hills.

Within the last twenty years, eight different quarries have been opened at various points along the strike of the deposit. Two have been successful; this is an unusually high percentage.

As early as 1845, several quarries were opened and operated for a time for the production of tombstones; there were some seven or eight of these old quarries, but they all went out of business many years ago, and it was not until about 1905 that development began on a really commercial scale. Since then, Alabama marble has been sold in all parts of the United States, in Canada, in Cuba and in South America.

It has been more extensively used for interior work than for other purposes, but it has been quite extensively used also for exterior work in buildings and for gravestones and other monuments.

It is a calcitic marble, its percentage of calcium carbonate running as high as 99½ and rarely falling as low as 98. It is as hard

A Western store built of Southern marbles: Alabama for counters and walls; Napoleon Gray for the trim.

as any marble of equal purity, and it is not surpassed by any marble in durability when exposed to the weather. Its working and carving qualities are of the best, and it will take and hold the most brilliant polish. It is quite translucent, so that a polished surface does not reflect the light in a glare as from a glassy surface. The light penetrates the marble to some depth and is then diffused from the small crystal faces. Consequently, it is admirably adapted for making the most of the light that is available without any unpleasant effects. The polished surfaces are, to all intents and purposes, impervious and are very easy to keep clean.

All of these qualities make Alabama marble especially desirable for interior work. Because of this fact, and not because it is not well adapted for exterior work, the producers of this material have found it more profitable to exploit it for interior work. There are other white marbles well adapted for exterior work and which are less expensive; the Alabama producers have generally left the exterior field to these other marbles, but besides a number of fine exteriors in more northerly locations, the exterior of the post office at Mobile, Alabama, and the marble facing of the lower part of the original building of the Atlantic National Bank at Jacksonville, Florida, are notable examples of Alabama exteriors.

In the lower part of the interior of the Washington Monument are a number of stones furnished by different states. There are two pieces of white marble from Gantt's Quarry, Alabama. They are very fine samples—like creamy white statuary marble—and it is said that at first those in charge of the monument declined to receive them on the ground that marble of such fine quality was not known to exist in the United States, and that they did not believe that it really was produced in Alabama.

The only finishing plant in the Alabama marble belt is that at Gantt's Quarry. This plant has furnished millions of feet of interior marble finish for important buildings all over the country—most of it having been finished ready to set at the plant in Alabama.

The different grades of Alabama marble

vary from a creamy white fine-grained marble, almost free of coloring matter of any kind, practically of statuary quality, and available only in small quantities and in pieces of moderate size, through two or three grades with creamy-white background and moderate to face veining or clouding of a grayish tone (available for jobs of any size), to two or three grades of fancy marbles, with veining or clouding, or both, of pink, orange, yellow, gray, greenish and black. The fancy grades are available in moderate amounts.

GEORGIA

In the northwest part of Georgia, mainly in Pickens County and in the vicinity of Tate, are produced several varieties of rather coarsely crystalline calcitic marble. They vary in color from a practically pure white of a considerably warmer tone than the ground mass of most of the white Italian marbles, through varieties with a white background and with veins and clouds of blackish gray and blue, to varieties in which the blackish veins and clouds become dominant.

In some varieties, the background becomes grayish white and in one it is pink. These marbles are widely used for exterior and monumental work, for which they are specially well adapted.

The grade which is quite or nearly pure white has been used for colossal statues; most of the grades are widely used for gravestones, mausoleums, etc., and all of them are used for exterior building work. A very fine example of an average grade of the clouded white is in the recent addition to the Stock Exchange in New York. The exterior of the Federal Reserve Bank at Cleveland, Ohio, is made of the variety with a pink background. It gives a softness of tone, combined with a suggestion of durability and strength, which, together with the excellence of the design, makes this a really notable example among American buildings. This grade of Georgia marble possesses, in a high degree, many qualities which are much sought after by architects at the present time. But to one who has not made a special study of materials from the standpoint of tone and texture when used in large masses, this fact would not be apparent from the examination of a small sample.

In many cases, where a small sample seems to be just what is wanted, the effect, in a large mass, is quite different, and *vice versa*. Many disappointments in the final effect of a finished building are due to a failure to visualize the actual effect of a large mass of a given material from the examination of a small sample. This particular grade of Georgia marble has probably been less used than any other, and yet where a certain neutral ground tone combined with agreeable texture is a principal object in view, it is one of the most desirable of them all.

Georgia probably comes next to Vermont in the amount of marble produced. The use of Georgia marble is country wide; it has been used in many of the most important buildings in almost every section of the United States.

In recent years, the tendency in Georgia, as in other marble-producing sections, has been to finish a larger percentage of the total production at or near the quarries, and to ship a smaller percentage in unfinished form. This, of course, greatly increases the value of the industry to its own state and locality.

It is said that in the early days, pieces, and even blocks, of Georgia marble were sent as far as Philadelphia by means of ox teams. This may be romance or legend, but even in those early days, the material found a surprisingly wide distribution. The mar-

ble industry of Georgia may now be regarded as an established and stable institution of which the people of the state may well be proud.

TENNESSEE

The marbles at present produced in Tennessee all come from comparatively near Knoxville; they are all monotones; they vary in shade from a very uniform light silvery gray—with just a suggestion of pink in the background—through various shades of pinkish gray and grayish pink, brownish pink (sometimes almost red) to chocolate brown. The Tennessee marbles are all calcitic. They consist of a mass of more or less fragmental fossil remains, in which the calcite has crystallized without destroying the organic forms, imbedded in a mass of finer material, which is either non-crystalline or else what the mineralogist calls crypto-crystalline, *i.e.*, the crystals are too small to be seen as such except under high magnifying power. The coloring matter in Tennessee marble seems to be distributed over the surfaces of the crystals. It is very small in amount—the percentage of calcite in these marbles being nearly always in excess of 98 and often reaching 99½.

These marbles all saw and work easily, take a high polish, and are impervious to an unusual degree; rank very high among the monotones from the standpoint of texture and color; all of them have beauty of tone and texture, but as in the case of all other marbles, some are more beautiful than others. Tennessee marbles have one great advantage over most of the imported monotones—in that they require no waxing, filling or patching; hence, they are adapted to uses where sanitary qualities are a prime consideration and also for exterior and monumental work.

Tennessee tiles make a most excellent floor; they wear well and evenly; and because of their neutral tone, they do not show the mud and dirt tracked in on a rainy day as much as most other marbles, and because of their imperviousness, they are easily cleaned. For the floors of entrance lobbies where traffic is dense, there is no better floor finish than Tennessee marble. But it is not simply for its utilitarian qualities that Tennessee marble is highly prized; where certain neutral color effects are desired, as they often are, its decorative qualities give it a very high rank. It is interesting—and typical of the marble industry generally—that those varieties of Tennessee marble which have the greatest decorative value, were, for a long time, reglected by the producers as being "off-shade." It requires an innate sixth sense—and often long study and experience besides—to estimate correctly the value and true place of a marble in the list of decorative building materials.

In many marble and stone producing centers, the choicest and most valuable material was for a long time thrown on the dump, until someone with a real feeling for material recognized its value, had the courage to use—and thus set a new fashion.

Tennessee is a very large producer of marble. The blocks are purchased by manufacturers everywhere, but in Tennessee, as in other producing centers, the tendency is to increase the percentage of the total product finished locally.

The marble industry in Tennessee, as elsewhere, has had its ups and downs, its failures and successes, its comedies and its tragedies, but it has become an established industry which will continue to bring wealth to the state and to the South long after many other natural resources are exhausted.

MISSOURI

In the southwestern part of Missouri, there is a geological formation known as

the Burlington Limestone. It is highly developed near Carthage and Phenix, and probably at other localities. Certain strata in the Burlington formation are finely crystalline or crypto-crystalline and take a high polish. In recent years, this stone, which is of a gray or buff-gray appearance, has been largely used as marble; it is, in fact, a monotone marble, as that term is used in the trade.

It is much used for interior work; some parts of the formation yield an excellent exterior building stone, which is not specially adapted for interior work. Probably this formation was not completely crystallized, so that only some of its members are real marbles.

The use of the marbles from the Burlington formation has grown very greatly in recent years; here also the tendency is to finish more and more of the stone locally, but the sale of blocks is on a large scale. Here is another southern marble industry which has come to stay.

NORTH CAROLINA

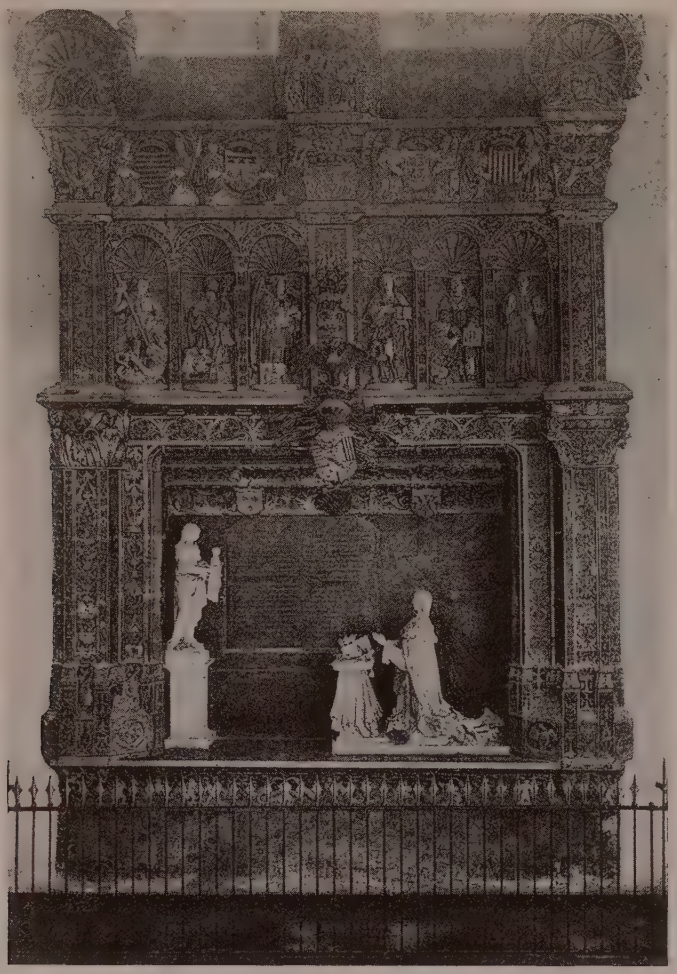
In southwestern North Carolina are considerable marble deposits; the stone is often blue and often dolomitic. So far as the writer is aware, the only marble produced there at the present time is blue and is used mainly for cemetery purposes. The geological reports on the North Carolina marbles do not lend much encouragement to the idea of development on a large scale, but that may come to pass, nevertheless. The only sure test of a marble deposit is to open and operate quarries, and that has not yet been done on a sufficient scale to be decisive.

OTHER SOUTHERN STATES

Marble is known to exist in the other southern and southwestern states already mentioned. No doubt, many of these deposits will some day be exploited on a permanent and successful basis. But even now, the states that are producing put the South in the forefront in the marble industry.

Of course, any industry is of the greatest possible value to its own locality when the raw material is worked into finished form at or near the point of production, because this results in a maximum of local disbursements for all purposes. From this point of view, the marble industry is already an important factor in bringing new wealth into the South, and will become more important as time goes on.

Blocks of Tennessee marble ready for shipment.



Tomb of René II at Nancy, by Mansuy-Gauvain.

THE EARLY RENAISSANCE IN FRANCE

The Transition Period is Characterized by a Picturesque Mixture of Classic Details With Gothic Conceptions

ITALY and France were the two main arteries through which the Renaissance flowed. In Italy the effort to clothe structures adapted to the requirements of a later age in a dress derived from the forms and proportions of antiquity, met with scant resistance. The readiness with which the national styles were transformed into a semblance of the classical was to be expected since there had persisted throughout Italian Mediæval architecture the Roman and Greek methods of wall and space composition, as well as of detail. Moreover, the abundance on every hand of antique models served as a constant reminder of the glories of Ancient Rome.

In France, on the contrary, "the vitality and richness of the Gothic Style, even in its

Illustrations courtesy Thomas Machen, architect, Baltimore, Md.

Chapel of Château d'Amboise, built by Charles VIII after his return from Italy.

decline in the fifteenth century, long stood in the way of any general introduction of classic forms" (Hamlin). This style was an almost direct antithesis of its distant origin. It was only the weakened condition of the national artistic mind, as betrayed by the feeble spirit and extravagance of the Flamboyant period, coupled with the demoralization and disorganization during the Hundred Years War, that finally made it possible for the Renaissance to gain its first foothold.

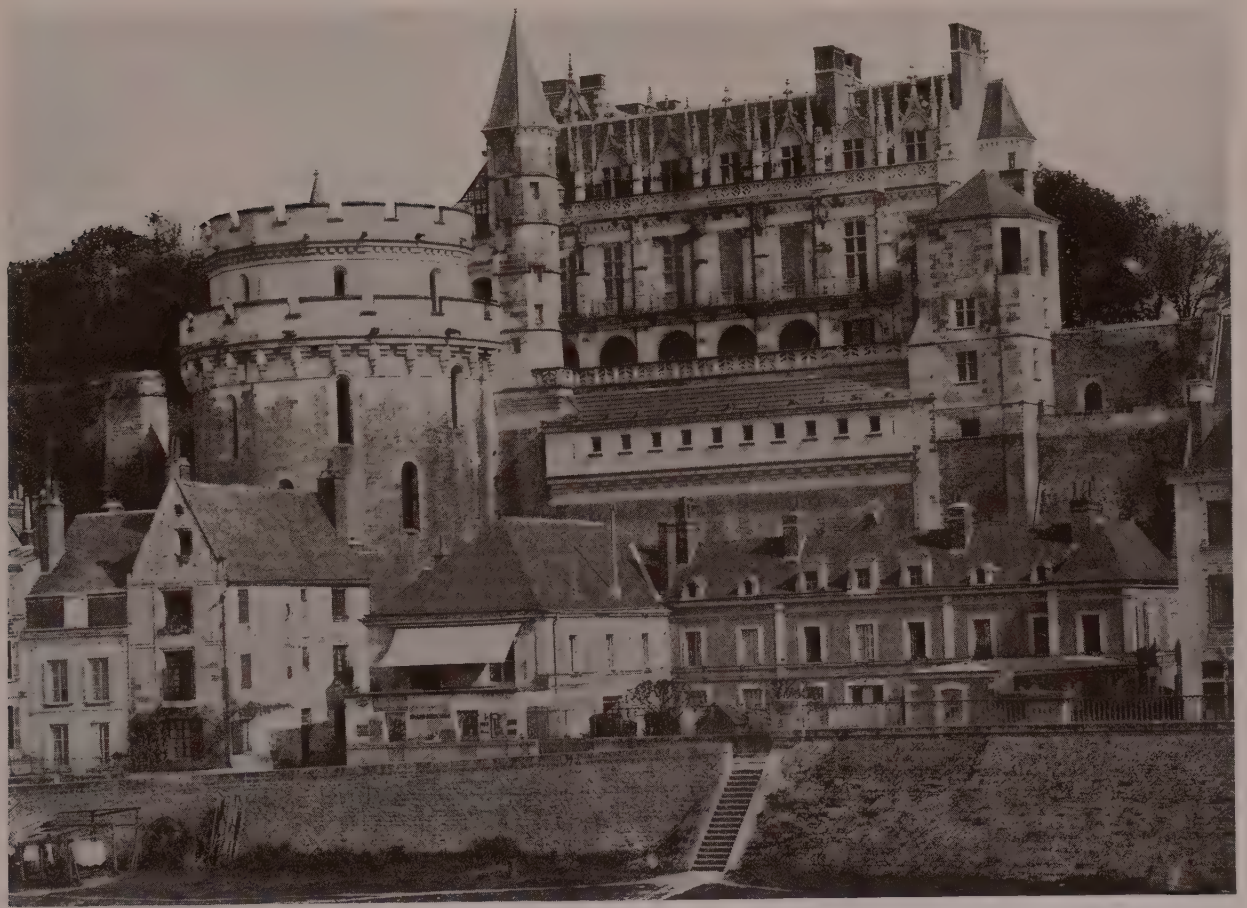
With the cessation of feudal turmoil in 1461 there set in a high tide of prosperity and peace. Building activity followed close on the heels of material wealth. An Indian summer of Gothic art prevailed for the last half of the sixteenth century. "As in the land of the 'Sleeping Beauty,' when the sleepers awoke, the turnspit recommenced turning the spit, the women their weaving, the men their usual vocations." (F. M. Simpson: A History of Architectural Development.)

The Holy See at Rome had been, during the latter part of the fifteenth century, in constant touch with the French Church; in addition, there were frequent embassies from Paris to the Italian courts. French eyes were impressed by Italian art. Philippe de Comines, beholding the Certosa di Pavia, wrote of "this goodly Charterhouse Church, which in very deed is the fairest that ever I saw, for it is all of fine marble." (History of Philippe de Comines: trans. by T. Danet, London, 1601). Articles of Italian workmanship began to appear in France in the wake of these travelers, and "the very fact that Italian quarries were the source of the marble supply necessitated that such larger objects as fountains or tombs, if of marble,

should be Italian made." (W. H. Ward: French Renaissance Architecture.)

There occurred in 1494 an incident that gave to the new style a greater impetus than any it had yet received. This was the remarkable expedition of Charles VIII into Italy to enforce his claim to the crown of Naples. Although a failure politically, it succeeded in providing a revelation to the thousands of men that made up his army. The richness of the buildings at Florence, Rome, Pisa and the other cities entered, their unusual designs and the lavish skill expended on their decorations must have made a powerful impression upon the French. On the other hand, the might of the invaders and their apparent wealth caused many Italian artisans to venture into France as a field for their activities.

Even before the expedition of Charles VIII, in 1475, the new style had made its appearance in altars, tombs and rood screens, and even small chapels. Francesco Laurana in 1479–81 rebuilt for Duke René the chapel of St. Lazarus in the old Cathedral at Marseilles, and also carried out a reredos, now in the church of St. Didiér at Avignon, in which buildings of Italian design occur in the background. The former consisted of a central column and two side pilasters supporting two arches, above which is an entablature crowned by two segmental pediments. The pilaster panels, columns and arches are carved with very



The Château d'Amboise. The round tower has a sloping driveway for horse traffic from the town clustered at its base.

delicate Renaissance detail, more Venetian than Florentine. The same sculptor executed the tomb of Charles of Maine in Le Mans Cathedral (1475), the so-called "Niche of King René," and the tomb of Jean de Cossa at Tarascon. All of these works were comparatively small and purely Italian in character; they were, in fact accomplished by Italians to suit the tastes of patrons who had become fascinated by the new style.

Charles' incursion was followed by others under Louis XII, Francis I and Henry II, all of which tended to the transplanting of the Italian art into France. The real start, according to Simpson, was on the banks of the Loire, the district most favored by the French kings during the end of the fifteenth and first quarter of the sixteenth century. Amboise, Blois, Loches—these places saw the court more often than Paris; Orleans was as important as any town in France. Here were built certain structures in which the Renaissance was introduced. These include the Louis XII wing of the Chateau of Blois, the Hôtel d'Alluye, the original Hôtel de Ville at Orleans, and the tomb of the children of Charles VIII in Tours Cathedral.

To understand these early Renaissance chateaux, it is necessary to bear in mind the plans of the Middle Age feudal castles which preceded them. These old castles were built with defensive towers, high-pitched roofs broken by dormers and chimney stacks; they were placed generally on some rugged site that compelled a picturesque irregularity. Some of these were remodeled later to provide the earlier country homes of the wealthy. Windows were cut in the walls, though the drawbridge and moat were retained as a protection against occasional bands of robbers. Where new buildings were erected, the steep gables, chimneys and dormers continued in the designs, giving a broken outline even though the plans became more orderly. The French chateau lost the unity of design that was the outstanding feature of French architecture in the Middle Ages. As C. H. Moore expresses it, the composition is "factitious," and not an "outgrowth and expression of natural conditions and actual needs." (The Character of Renaissance Architecture.)

The transition period in France is comprised by the reigns of Charles VIII and Louis XII, and the early years of the reign of Francis I, a period extending from 1483 to about 1520, and marked by a quaint mixture of Gothic Flamboyant conceptions and classic detail. The style, if such it can be called, is generally referred to as that of Louis XII.

In character, the buildings were vertical and comparatively tall, marked by an intricacy of outline in sharp contrast to the orderly masses of earlier years. The chief feature was the treatment of the roof, generally high and steep, with chimneys, ornamental ridges, finials, lanterns and lofty dormers forming a medley of angles and vari-colored surfaces that was at least picturesque and interesting.

"The elevations were broken by buttresses and turrets, canopy work and hanging arches, and finished with battlements, pinnacles, and machicolations. A luxuriant vegetation wreathed its tendrils in the hollows and sprouted on the skyline. Figures with supple bodies and writhing limbs peopled the labyrinthine curves, and wall surfaces were powdered with devices. In arches and openings the prevailing pointed form (which, curiously enough, survived longer in Italy) was replaced with growing frequency by the circular and elliptical, or quasi-elliptical with three or five centers, or by flat lintels, the haunches of which were rounded off. Openings were deeply recessed,

The wing of Louis XII, Château de Blois. The Tower of the Grand Stairway is shown on the left.

often fringed with an order cusping and sheltered under a hood-mould, sometimes of ogee form, carried on corbels set below the springing. Windows were usually two lights wide, with or without transoms, a type which persisted in France till the introduction of wooden frames in the seventeenth century. Ranges of more than two lights are rare. The lights are generally wider than in England, both absolutely and in relation to the height, being sometimes wider than they are high. Bay windows are almost unknown, but oriels are frequent. Piers, where not formed of a group of wave mouldings, were square, set anglewise, or circular and with reticulated or spiral decoration. Capitals were often absent, jamb and pier mouldings running round the arch. In timber construction, many of the above characteristics were equally prevalent and their corbelling, brackets, and barge-boards gave scope for further enrichment." (W. H. Ward: The Architecture of the Renaissance in France; Vol. I.)

The above description of the late Gothic is an equally true description of the Transitional period. Italian detail was first introduced into the parts carried and enclosed; the Gothic persisted in the members which carried weight and enclosed spaces. The latter, such as piers, shafts, jambs, plinths and bases, maintained their old forms; the decorations, such as the capitals, panels and hollow mouldings, were Renaissance of the North Italian.

The earliest palatial houses of the period were ornamented with debased Gothic details, with the Renaissance elements introduced sparingly and hardly noticeable. As the invasion of these elements progressed, the houses partook more and more of the spirit of the Italian palaces, but never actually followed their plans, even remotely. Certain efforts were made to secure more symmetrical spacing, it is true, but this took the form rather of more extensive accommodation. Rooms increased in size and number; terraces, arched galleries, balconies and a multitude of windows were provided, all making for the greater enjoyment of the open air.

Unfortunately, there are no complete chateaux remaining that were built entirely in this period. The palace of Gaillon, erected about 1500 for the Cardinal-Archbishop of Rouen, George of Amboise, was a curious mixture of styles, but one of the most notable buildings outside of the Loire district. Several names are associated with the structure, including Nicolas Biàrd, Pierre Fain, Guillaume Senault and Fra Giocondo. The old foundations of a castle built half a century before served as the plan, and the irregular moat, drawbridge, round corner towers, turrets and dormers gave it a mediæval appearance. Gothic prevailed in the greater part of the castle, but the cross gallery and the lantern of the chapel were in the Transition Renaissance.

The Chateau of Amboise, transformed by a colony of Italians for Charles VIII after his return from Italy, was the starting point of the movement in that locality. This colony contained, besides Fra Giocondo, Guido Mazzoni, Jerome Passerot, Domenico Bernabei and several intarsia workers. The two large round towers have round-headed windows; in addition to this evidence of Italian influence, there were sloping ways in these towers to enable horse traffic to ascend from the town below into the castle. These ways ran spirally around a hollow newel 25 feet in diameter, circular on the interior but octagonal on the exterior. Dom Pacello laid out a pleasaunce within the ramparts and this was surrounded by a colonnaded cloister.

The Louis XII wing of the chateau of

The effigy of Louis XII above the doorway of the wing to the Château de Blois, built by him.

Bloise, of which mention has already been made, showed the egg and dart scheme on the lower portions of the cornice, while mediæval details appeared elsewhere. This cornice shows a flat lower member against which is a Romanesque corbel-table treated in Flamboyant Gothic, with the small arches splayed and having a tri-centered form. The upper mouldings have profiles of very pure Gothic; above the whole is a parapet of elaborate Flamboyant design. The façades of the east and south wings show the influence of the new movement in the flat, horizontal lines of brick and stone. Commingling with these Renaissance elements are Gothic corbels, gargoyles, traceries and cuspings. The effigy of Louis XII in the niche above the entranceway is typical of the Transitional style. The equestrian statue of the chateau owner was frequently displayed in this fashion; another example of this conceit is seen in the doorway of the palace at Nancy.

At Chateaudun, the castle begun in 1502 was enlarged by Cardinal Francis of Orleans —Longueville by the addition of a wing which, while its chief features were Gothic, contained certain Renaissance indications. These were visible in the window treatment of the court front, and on the balustraded cornicione. The stair tower, too, had an open loggia of coupled arches, elliptical in shape in each of the four stories. The front of this tower was treated in an enriched bay and was set flush with the wall of the façade. The two upper stories reached above the main cornice and were flanked by round turrets overhanging the wall, which was corbelled out to support them. The cornice was a mixture of Classic and Gothic, but the balustrade and internal treatment of the loggias were in the best Italian manner. The

The Town Council House at Compiegne.

stair newel showed an interesting mixture of the styles.

The town homes of the wealthy were known as "hôtels"; those of the middle class were called "maisons." The town hall was usually called the "Hôtel de Ville." Many of these structures built during the end of the fifteenth and beginning of the sixteenth centuries exhibit the influence of the Renaissance in their mouldings, in the introduction of arcaded loggias, Italian gardens, vases, medallions and friezes of dolphins. The Hôtel d'Alluye at Blois, built about 1512 by Florimond Robertet, a minister of Louis XII, showed an interior enriched with Italian ornamentation. The town council house at Compiègne, showed a quaint intrusion of Renaissance in the window treatment and friezes. The Hôtel de Ville at Orleans, by Viart, built early in the reign of Louis XII, shows a complete fusion of the two styles.

Unlike in the Middle Ages, when religious building played the most prominent architectural part, we find, beginning with the sixteenth century, that secular construction supplanted church construction both in importance and initiative.

The reason for the change was to be found in the diminishing power wielded by the religious leaders. The clergy were becoming more worldly, taking part in political and social life to a far greater degree than ever before, and losing, consequently, much of their spiritual influence. Then, too, the churches erected during the preceding years were fully sufficient, both in number and capacity, to accommodate the ecclesiastical demands of the time, whereas the secular structures built in Mediæval days were scanty and unsuited to the new standards of life.

The influence of the Renaissance was felt at first in the minor works, such as chapels, tombs, and smaller churches, and even here it was confined mostly to details and to such church fittings as altars, screens, and the like. The completion of the more ambitious projects begun in Gothic times was carried out usually in the original style. Senlis, Beauvais and Sens, for example, are purely Gothic. Even the Cathedral of Orleans, begun under Henry IV, was finished under Louis XV without the adoption of the new principles.

At Avignon, there were used in the west front of the church of St. Pierre several Renaissance details. In the wall surface are two wreaths bound by ribbons, evidently copies of Italian prototypes; and the two round turret lights have carved architraves of the same origin.

The Chapel of the Castle at Ussé, built about 1510, has a front that is even more wholly Renaissance. The tracery is in the form of a pierced shell and the pinnacles of tapering candelabra. Even here the effect of the lines is the vertical of the Flamboyant, more especially because of the grouping of the entrance and the window above into one tall mass accentuated by the pointed arch crowned by the canopy.

"Such is the early Renaissance architecture of France. Notwithstanding its factitiousness, and its ornamental incongruities, it still has, as I have said, a distinctly French expression, though it has not the reasonable character of the native art of the Middle Ages in its integrity. But the departure from their own ideals and traditions was destined to be carried further, and at length to reach results which should still more profoundly contradict the true native spirit." (Charles H. Moore: Character of Renaissance Architecture.) In our next number we will treat of some of these results as they appeared during the reign of Francis I.

THE WRIGLEY BUILDING

One of the Dominant Structures of Down-town Chicago's Skyline

MARRIED at the age of twenty on a salary of $10 a week; the possessor of only $32 capital at the age of thirty; today one of the biggest and most successful advertisers in the world—such is the brief outline of William Wrigley Jr.'s history. The business that he founded had its profits three times swept away by reverses; twice his buildings were destroyed by fire; and yet his four factories now turn out more chewing gum than all the others combined, and the annual turnover is over $30,000,000.

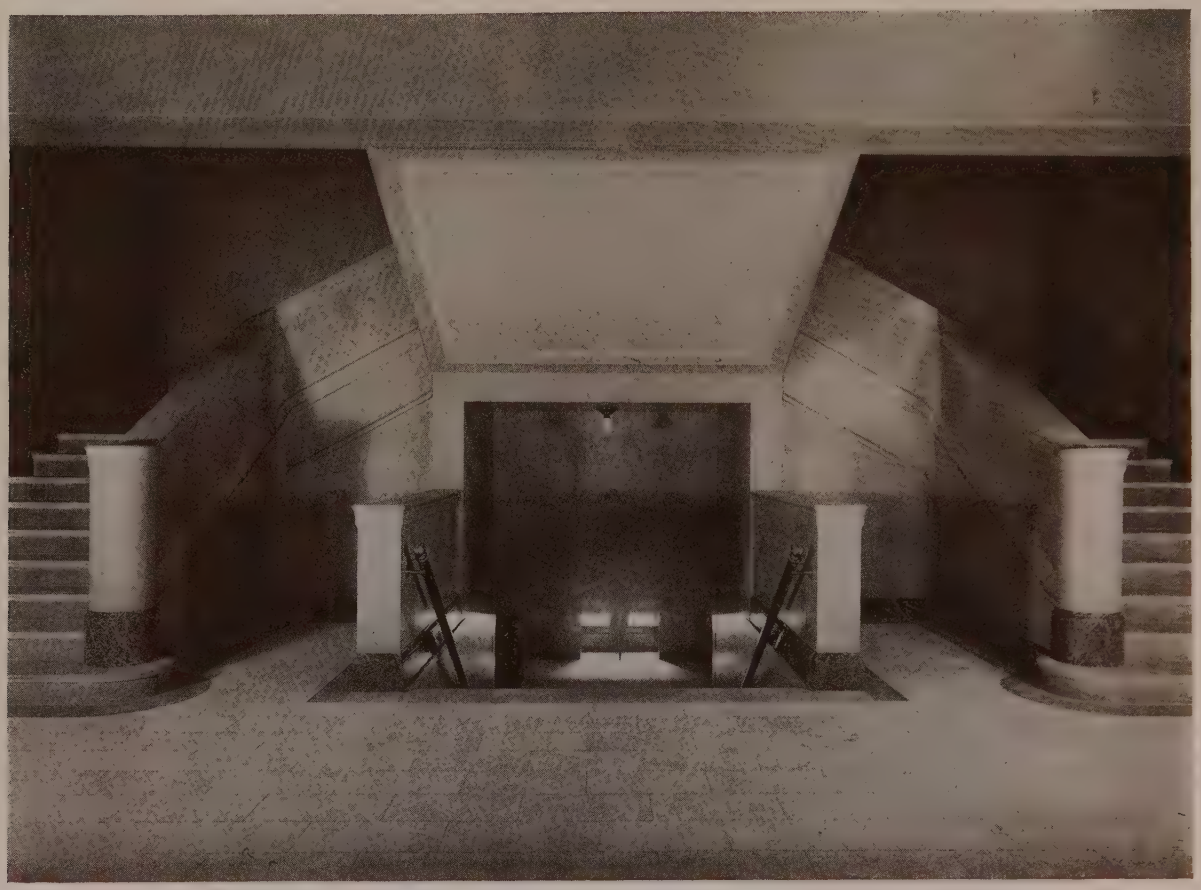
In Chicago there stand two comparatively new buildings that are finely representative of this tremendous achievement. They are the two Wrigley Buildings, and they occupy a conspicuous site just north of the Chicago River and facing the new Bridge Plaza. In February of 1920 the William Wrigley Jr. Company acquired an irregularly shaped block of property bounded by the north bank of the river, North Water Street, Rush Street and Michigan Boulevard. It was seen from the map that this spot would put any structure erected on the lot in a position that appeared to be at the head of the street from the viewpoint of travelers on the

boulevard from Park Row to the river; and, also, the river would serve as a break in the line of the city and give the structure a most unusual prominence. It was, to say the least, a strategic, conspicuous location, with no equal in Chicago.

The area of the property was a trifle over 11,000 square feet and none of the corners were right angles. On account of the shape and because one side was greatly elongated, it was possible to develop the structure so that 15 per cent of the gross lot area was represented by a net rentable area on each floor.

The architects, Graham, Anderson, Probst and White, have expressed the wishes and ideals of the owner in a way to do credit to Chicago. The tower of the south building, which was the first portion erected, rises to a height of 436 feet above the lake level, though the actual top of the clock tower is 468 feet above the water's edge. This tower is marked by a large lantern surmounted by a silvered spike 32 feet in height.

All the standing marble in the lobby is Verdello. This includes wainscoting, pilasters and columns, as well as the caps.



Practically all the material shown in this view, with the exception of the ceiling, is marble—floor, stairway, walls and bases.

The exterior material of both buildings—the north and south structures—is in harmony; they stand upon a base of stone intended to conform in design to the adjoining bridge abutments, the mass of the buildings being of light-colored terra cotta grading down from cream color at the top to a grayish tone at the ground floor where it joins the stone. The great height produces an effect of verticality which has been emphasized by the architectural lines, which are those of the French Renaissance of the period of Francis I. This style gives emphasis to such lines as those outlining the tower, and allows of much figure and detail work in decorative portions of the exterior.

On account of the outstanding position of the two structures, it was considered highly desirable to illuminate them at night by means of flood lights and they are therefore clearly visible at all times. The unusual shape and advantageous position make them remarkably picturesque to the onlooker, and this is enhanced by the powerful revolving searchlight placed in the lantern, which serves as a beacon to the mariners on the lake as well as to the navigators of the air.

The south or tower building contains the Boulevard Bridge Bank on the Michigan Avenue level and the north section contains Grayling's Restaurant and a number of fine shops. The floors above are laid out as modern offices with the most complete appointments. The general offices of William Wrigley Jr. Company are located in the

tower building, and numerous corporations of national importance are housed in the two buildings.

One of the chief features of the interior of the Wrigley Building is the extensive marble treatment. The floors of the entrance vestibule, lobbies and elevator halls of both sections are of Clear Face Carthage marble, and the wall wainscoting, pilasters and columns, including the marble caps, are of Verdello marble. The corridors throughout the south section are of selected White Alabama with Verde Antique border and base and Madri Vein wainscoting to a height of 7 feet 7½ inches. The toilet rooms throughout the south section have Alabama floors and Alabama wainscoting and double "C" partitions. In the north section the floors of the corridors are of Alabama with Tinos No. 3 borders and the wainscot is made up of a 6-inch Tinos No. 3 base and Clear Face Italian marble wainscoting to a height of 7 feet 7½ inches.

To realize more clearly the amount of marble used in the corridors, it may be stated that more than 11,000 lineal feet of

Details of stair shown on opposite page.

slabs 7 feet 7½ inches high were required, or in excess of two miles. Throughout the building there are a number of public toilet rooms and fourteen private ones with shower compartments. All the toilets are of White Italian marble floors with Clear Face Italian first-grade wainscot and double "C" partitions. The marble contractors claim that no other building in the United States contains a quantity that equals in square feet or cubic contents the amount of first quality Clear Face Italian marble that has been used here. The standard of excellence required in these materials was duplicated in the workmanship throughout the double structure and is characteristic of the business methods and ideals of the owners.

A great number of users of marble work feel and believe that after the contract has been completed and paid for, they are through with it for all time and that it needs no further attention. As a matter of fact they are then in exactly the same position as the man who buys a good pair of shoes and fails periodically to have them shined. The Wrigley Building enterprises realized this fact. They have, consequently, arranged to employ two marble men, who continually repoint the joints, repolish and finish the exposed surfaces as required. As a result, the marble work is at all times in splendid repair and presents a new, fresh appearance.

A typical upper corridor in the Wrigley Building. The wainscoting is F. M. English Vein Italian; the floor is Tennessee.

A LIST OF THE WORLD'S MARBLES

By J. J. McCLYMONT

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

GROUP A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

GROUP B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

GROUP C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

GROUP D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

Mysore—See Black Dolerite, Green Felsite, and Quartzite.

Namur

For marbles listed from Namur, Belgium, see—

Bleu Belge	Noir Fin
Bleu St. Remy	Noir Veine
Breche Du Nord	Rouge De Flandre
Breche De Waulsort	Rouge Fleuri
Breche Francaise	Rouge Griotte
Grand Courtil	Rouge Imperial
Griotte St. Remy	Rouge Royal
Heer Marble	Rouge Royal Vif
Noir Belge	Royal St. Remy
St. Anne	

Nanquin Coquiler

Quarried at Mentious, in the Upper Garonne, France.

Warm whitish-brown containing small fossils. (Blagrove.)

Napoleon

Quarried in the Heureuse Valley, near Boulogne-sur-Mer, France.

Medium gray, veined with light red and brown.

Another variety is pink or rose and the third variety is of a rose fleur or fine ruddy brown.

Napoleon des Vosges

Quarried at Schirmeck, in Vosges, France.

Various brown tints with veins of white, gray and auburn.

Napoleon Gray—Group A.

Quarried at Phenix, Missouri.

Dark gray with shades of pinkish glow and with bluish veins at regular intervals.

Napoleonite

Quarried in Corsica.

Dark gray, marked with orbicular light gray spots.

Napoleon Marbles

In addition to those prefixed Napoleon see Marquise.

Napoleon Pink

Same as Knox Pink (Tennessee).

Nassau Marble—See Famosa.

Natal—See Port Shepstone.

Navarra Province—See Blanco Rosado and Verde Moulin.

Naxos Marble or Naxian Marble.
Quarried on the Island of Naxos, one of the Cyclades.
Coarse grained white statuary.
A narrow channel divides Naxos from Paros, both islands are included under the name of Paronaxia. Some writers have confused Naxian Marble with Parian and they are similar in many respects.

Nebo Golden Travis or Mt. Nebo Golden Travis or Bird's Eye—Group D.
Quarried on Thistle Mountain, Utah.
Brown variegated with yellowish-brown.
Takes a high polish.

Nebresina Quarries—See Dark Roman.

Negato—See White Negato.

Negropont—See Greek Cippolino.

Nehden—See Alma and Goldedar.

Nephrite
Same as Jade.

Nero Antico or Black Antique and Noir.
An ancient marble believed to have been quarried near the promontory of Taenarium, now Cape Natapan, Laconia, Greece. (Watson.)
Brindley in 1895 confirms this.
Blagrove in 1888 says the quarries have been lost.
Inasmuch as Nero Antico was used by the Romans and perhaps named by them and at the same time called Marmar Taenarium, it seems clear that the location as given must be approximately correct.
Jet black with faint streaks of clear white or dusky black with grayish bands.

Nero—Black.

Nero Bigiastro
This is probably a variation of Nero Antico.
Ebony black with bands of mottled white, brown and gray.

Nero Strisciato
Sometimes called Nero Antico, which is probably modern.
Black with streaks of white.

Nestier—See Bise African, Bise Rose and Bise Violet.

Netler Dale—See Bird's-Eye (Derbyshire).

Neustadt
Kunzendorf, a small town where the Gray Kunzendorfer Marbles are quarried, is about five miles west of Neustadt.

Neuvillette
Same as Bleu de Neuvillette.

Nevada
It is reported that marble of a great variety of colors occurs in the Tempiute Mountains in the southeastern part of the state. We have no record of any attempts to quarry this stone.

Nevicarr—Snow.

New England—Group C
Quarried at Stainton, near Barrow-in-Furness, Lancashire, England.

One variety is light fawn colored without much veining. Another is darker with purple and brown markings. (Blagrove.) Dapple Limestone and White Limestone from the Newton Quarries near Dalton-in-Furness, Lancashire, England, aresometimes known locally as New England Marble and inasmuch as Dalton and Barrow are both near Stainton, the above stones are probably from the Newton Quarries.

New Haven

According to Professor C. V. Shepard, 1837, a marble described as gray or dove colored clouded with greenish-yellow serpentine, the latter containing black grains and sheets of magnetic iron ore, was quarried shortly after 1811 at a point 2½ miles west of New Haven, Connecticut. Operations were abandoned a few years later.

New Jersey—See Jersey Green.

The only quarry reported as being in operation at present is the Lizzie Clay Quarry at Marble Hill, Phillipsburg.

New Mexico—See Alamora Golden Fleuri, Alamora Gray Fleuri and Alamora Gray Veine.

The Alamora Quarry at Alamagordo, Otero County, is the only marble quarry (as far as we know) now in operation.

New Montaranti—See Siena Montaranti.

Newton Abbot—See Bradley Woods, Gray Ogwell and Red Ogwell.

New Pedrara Onyx—See Onyx Pedrara.

Newton Bushell—See Devonshire Marbles.

Newton Quarries—See Dapple Limestone and White Limestone.

New York Marbles

According to the U.S. Geological Survey Stone, 1921, the only active marble quarries in New York producing building stone were:

Lepanta Quarries at Plattsburg, Clinton County.

The Dover Quarries at Wingdale, Dutchess County.

The Gouverneur Quarries at Gouverneur, St. Lawrence County.

The Glenn Falls Black Quarries, at Glen Falls, Warren County.

New Zealand Jade or Greenstone.

Quarried at Milford Sound, Otago, New Zealand.

According to Watson, most of the varieties are highly translucent, more so than any other variety of this mineral except the rare Emerald Green Jade of Burma.

New Zealand Marbles

According to Watson large undeveloped deposits of marble are found in the neighborhood of Milford Sound on the west coast of South Island, New Zealand.

Niccolo

This ancient Agate from unknown source is described by Pullen as white with rings of reddish-brown.

Nieder Lindewiese—See Lindewiese.

Nievre—See Jaune de La Nievre.

Niggerhead—See Gabbro.

Is a name applied to rounded bowlders of black color.

Nile Alabaster or Nile Onyx.
Same as Egyptian Onyx.

Nimes
Near Alais, from the Alais Quarries, about twenty miles northwest of Nimes, in Gard, France, Lanquedoc is quarried.

Nippon Island Marbles—See Black and White Marble, Black Marble (Serpentine), and White Negato.

Nivelles
Feluy-Arquenne is quarried near Nivelles and is sometimes known as Nivelles Marble.

Nivernais
Quarried at Champ – Robert, Nievre, France.
Bluish-gray. (Blagrove.)

Nivernais Orange—See Orange du Nivernais.

Nizhne Tagilsk—See Russian Malachite.

Noble Serpentines or Precious Serpentines.
These are stones among the serpentines which possess a certain degree of transparency.

Noiratre—Blackish.

Noir Antique—Group B
Quarried at St. Crepin, in the Upper Alps.
Uniform jet black. (Blagrove.)

Noir Belge or Tournai Marble—Group B.
Quarried near Basecles, Hainault, Belgium.
Black marble sold in four grades:
No. 1—Or best. No. 3—Common.
No. 2—Second best. No. 4—Inferior.

Noir Belge—Group B.
Quarried near the left bank of the Meuse, a little north of Mazy and Golzinnes.
Black.

Noir de Castres
Quarried at Castres, Tarn, France.
Deep black of medium quality.

Noir de Sable—Group B.
Port Etroit Quarries at Juique near Sable, Sarth, France.
Fine black with well defined white veins and few fossils.

Noire—Black.

Noir Fin—Generally known as Belgium Black—Group B.
Quarried near St. Denis, Namur, Belgium
Brownish jet black.
No. 1 blocks are seldom more than 11 inches thick.

Noir Francais—Group B.
From numerous quarries near Houdain, Pas de Calais, France.
Black but not as fine in texture or deep in color as the Belgian Black. Some varieties have small spots of white.

Noir Jurassique
Quarried in Jura, France.
Pure Black. (Blagrove.)

Noir Sable
Same as Noir de Sable.

Noir Veine—Group C.
Quarried at St. Aubin, Florennes, Namur, Belgium.
Dark blue black with slender white markings.
This marble is practically the same as Bleu Belge.
Takes good polish.

THROVGH THE AGES

VOL. 3 NOVEMBER, 1925 NO. 7

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PHILOSOPHY

One of six heroic marble statues on the main façade of the New York Public Library, New York. Paul W. Bartlett was the sculptor.

THROVGH THE AGES

A Monthly Magazine devoted to the uses of Marble – its universal adaptability, beauty, permanency and economy.

VOL. 3 NOVEMBER, 1925 NO. 7

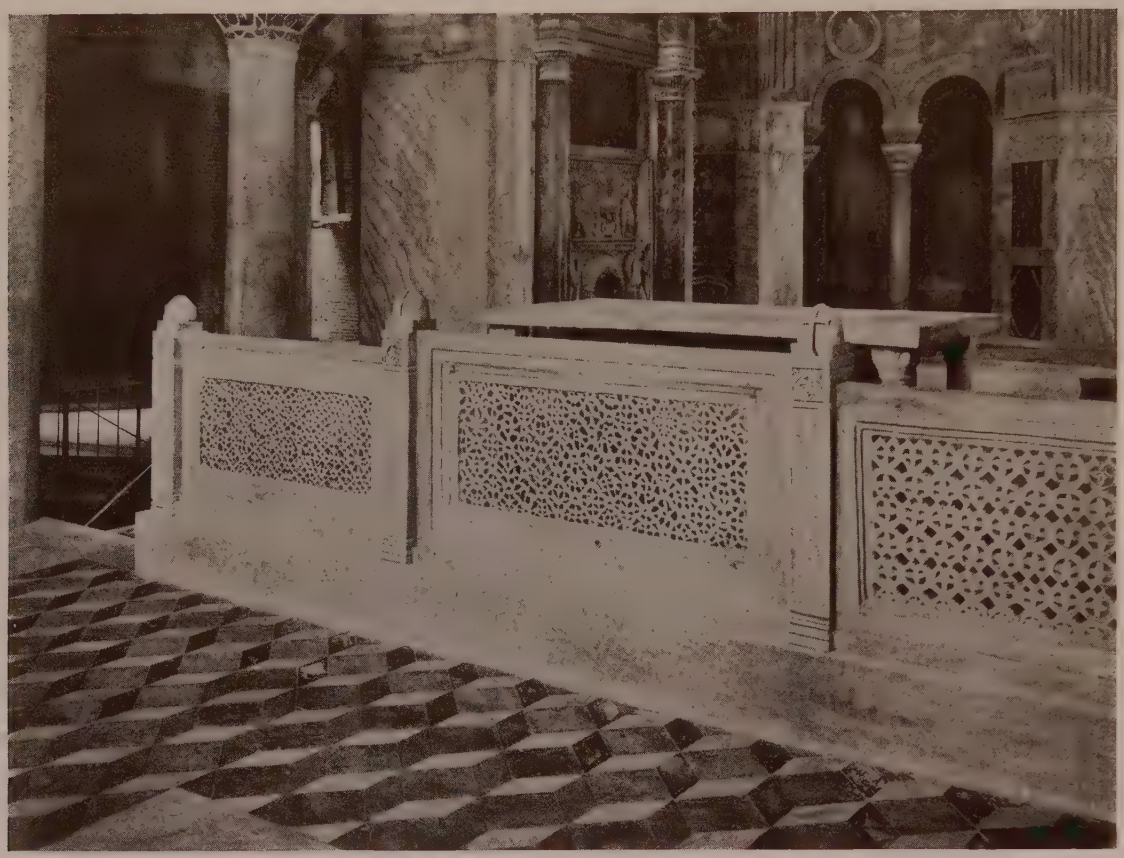
MARBLE MOSAIC PAVEMENTS

An Art that was Practiced in Greece as Early as the Fourth Century, B.C.

"THE art of marble decoration," wrote George H. Blagrove some fifty years ago, "consists in applying real marble to purposes partly constructive, but chiefly decorative." Imparting decorative interest to stone pavements by means of marble mosaic is only one of several forms of this art, but it is one that has been practiced for thousands of years. It may be roughly defined as a mode of forming patterns, or even pictures, by the inlaying of small pieces of marble. Almost from the time that man vacated his cave and began to build for himself structures in the open, has this art been recognized as contributing a specific value to the architect's composition, a value not attainable by any other means.

In Greece, at the time of Alexander of Macedon, inlaid pavements of variously colored marbles were considered the most sumptuous of decorations. These were mainly of fretwork in conventional, geometric patterns and bore the name of Opus Alexandrinum. Pliny mentions certain early pavements called *Lithostrata*, formed of colorless tesseræ, the work of one Sosos of Pergamos, whose masterpiece was the "Asaroton Œcon" or the "Unswept Hall." This represented the crumbs and fragments of food that would be left on a floor following a banquet. There was depicted also a cantharus, or two-handed vase, from which a dove was drinking, while other doves were shown pluming and basking in the sun. According to Athenæus, the art had advanced so far by the third century B.C. that floors were laid down in the great ship of Hieron II that were composed of small cubes of marble of every color, so arranged that they formed a series of pictures that depicted the entire history of the siege of Troy. History says that 300 workmen were occupied an entire year in the execution of this work.

From Greece, the art was carried by Greek artisans to Rome, where it was known as Opus Musivum (mosaic work), a general name expressing decoration produced by placing together small portions of stone, marble or glass, colored either naturally or artificially. The Romans followed two distinct modes of construction.



The pavement (Opus Sectile) of the sixth century basilica of S. Vitale, at Ravenna, gives the impression of rising up in relief—a disagreeable shadow effect that should be always avoided.

The earliest form of the first is seen in the Opus Tesselatum; the second was called Opus Sectile. We owe to these modes two different comparatively modern methods of design which can be followed in floor, wall and ceiling decoration either in black and white or with colored marbles.

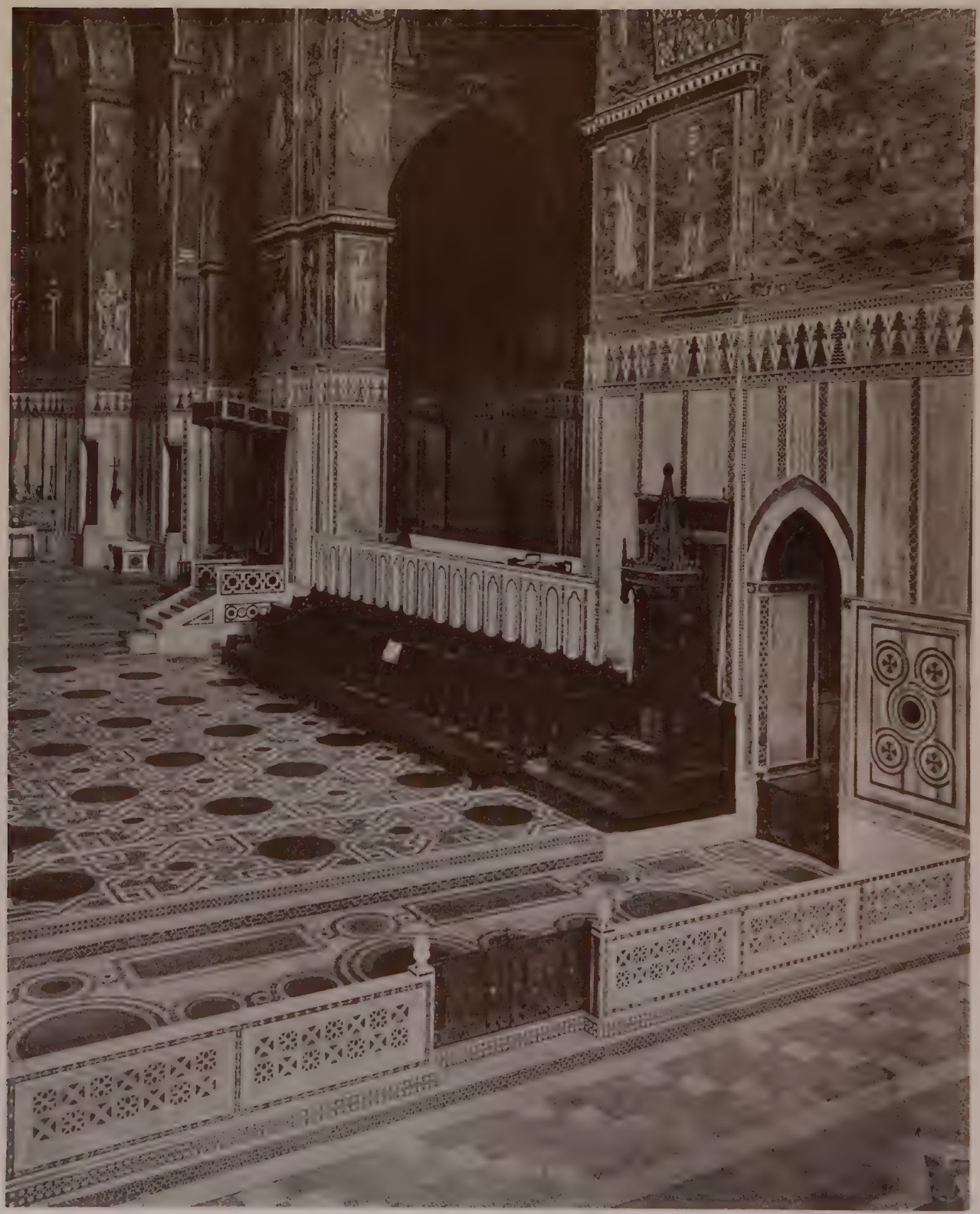
In the Opus Tesselatum, the small marble cubes or tesseræ (so called from their resemblance to gamblers' dice) were about three-quarters of an inch square, sawed or fashioned by hand to the right shape. These were embedded in cement in accordance with a predetermined design, usually simple geometrical patterns. When the surface had been smoothed and polished, this design was thus reproduced in a material that was practically exempt from change or ordinary decay. At first, black and white marbles only were used, the colored stones not being introduced until a later period. Pavements of this description are found wherever the Romans settled, not only in Rome itself, but in Asia Minor, Spain, Gaul and England; and not only in the large cities, such as Carthage or London, but in the most remote villages and insignificant wayside villas. Indeed, scarcely a house of any size in Pompeii appears to have been without its mosaic pavement.

The pavements were not called *tesselatum* unless the component units were exclusively of cube shape. About twenty or thirty years before the Christian era, there was

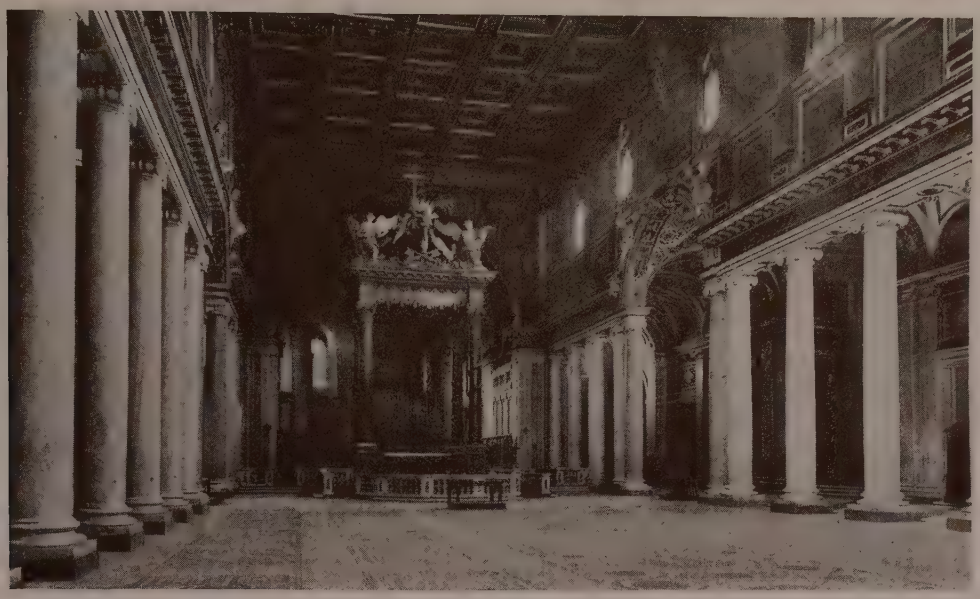
begun the practice of using cubes of a vitreous composition in conjunction with the marble tesseræ, to form representations of figures, fruits and flowers, in colors but without shading. This was called Opus Figlinum, and was used more in mural work than in pavements. It was revived in the sixteenth century at the time of the Renaissance under the name of Roman mosaic, by which it is still known. Vitruvius says that in his time they made a kind of stucco mixture to form areas upon terraces in courtyards, etc., and before it was dried incrusted small pieces of colored marble in it. Sometimes they mixed crushed tile with the coating, which gave it the appearance of red granite. This last was called Opus Signinum, from the city of Signia, celebrated for its tiles.

Opus Vermiculatum differed from Opus Tesselatum in that the tesseræ consisted of irregular shapes and sizes of marble, glass, precious stones and fictile ware, some pieces measuring as little as one-twentieth of an inch across. These pieces were so placed as to afford lifelike imitations of natural objects, with colors and shadows of such delicate graduations as to resemble the work of the painter's brush. In the background, or in large masses of solid coloring, the lines of the design caused the divisions to assume an appearance like a mass of worms; hence the name. Blagrove in his "Marble Decoration," comments somewhat caustically about

Another example of Opus Sectile is shown in the floor of the nave of the Cathedral of Siena.



Opus Alexandrinum was used in the floor of the choir of the Cathedral at Monreale, built in the twelfth century.



The marble mosaic pavement in S. Maria Maggiore, Rome.

the appropriateness of this method: "It is now generally admitted that such work is out of keeping with the proper treatment of mosaic, besides being unsuitable for decorations of an architectural character. It may be remarked that what happened in the later development of the art of mosaic is what has too often happened in connection with other arts allied to architecture: fundamental principles of design which first suggested themselves as being characteristic of the material employed, were lost sight of as mechanical methods of execution became elaborated."

The second distinct method of construction was the Opus Sectile, really a kind of stone marquetry that produced both pattern and color. This was applied by the Romans most generally in pavements. The separate units, called crusta, were thin slabs of marble cut into geometrical shapes and arranged in patterns. Different colored marbles were used, and in general the patterns were of an Oriental origin, since the art came by way of the Greeks from Persian sources. This eastern influence was accentuated after the end of the third century when western civilization came into closer contact with the so-called barbaric races. Angular and interlacing patterns of the type found in Moorish and Arabic structures replaced the round and square character of the Roman creations. The Opus Grecanicum found in many of the Romanesque churches of Italy showed the effect of this tendency.

Opus Alexandrinum is supposed to have been introduced into Rome early in the third century. It consisted, as in the Opus Sectile, of units cut into various shapes, but these shapes were always geometrical—triangles, squares, oblongs, hexagons, rhomboids, circles or portions of circles, etc.—and so joined as to form a regular geometrical pattern. Moreover, the units were inlaid in channels cut into slabs of white or light-colored marble, the units themselves being composed of colored pieces. Dark porphyry and green serpentine were most frequently used for this purpose, and Giallo Antico is found in some specimens, though believed to have been introduced alter. Lapis Lacedæmonium, a name given to Green Por-

Opus Sectile in the Palatine Chapel of the Royal Palace at Palermo, built in the style of the Norman Gothic.

phyry and Ross Antico, was also used. S. M. Burnham, in his "History and Uses of Limestones and Marbles," says: "Lapis Lacedæmonium was not employed by the Romans for sculpture or large architectural works, but for paving dwellings, temples, piazzas and roads. Nibby states that the Grotto of Egeria was paved with serpentine, and that the piazzas or courts of Helio-abagus, on the Palatine, were paved with Lacedæmonian stone and porphyry. The practice was adopted by Alexander Severus,

from whom it took the name of Opus Alexandrinum. It is said in one version of the Scriptures that a court in the palace of Ahasuerus of Shushan was paved with red, white and black marble."

Both in the basilica of Santa Maggiore at Rome, executed in the fourth century, and in the Duomo at Florence, built in the twelfth century, there are pavements of Opus Alexandrinum, the former with small triangular pieces of inlay that measure not more than one-quarter inch across, the latter with small central stars in red marble with black marble triangles surrounding them, set in a ground of white. Numerous examples exist throughout Italy and some other parts of the continent. In England it was never extensively employed, though used in some parts of the shrine of Edward the Confessor, on the tomb of Henry III, and for the paving in the choir of Westminster Abbey and Becket's Crown at Canterbury, where curious patterns may be seen. The Cathedral of Siena has a pavement of Opus Sectile that exhibits a remarkable unity of purpose despite the fact that the work was carried on over a period of about 200 years. "The entire Cathedral floor," wrote H. D. Everlein, in *The Architectural Forum* a few years ago, "is divided into sections that correspond more or less exactly with the architectural subdivisions of the building. . . . The method of execution, upon close examination, proves to be singularly direct and not nearly so complex as might, upon a superficial glance, appear. The pieces of marble are of various sizes, frequently large, and are laid together very much in the manner of the units in puzzle maps, in irregular segments yet in strict accordance with design.

"The pavement is executed very largely in black and white marble. Much of the earliest work, and likewise much of the best, was done altogether in black and white. In other compositions, however, red marble was introduced for the ground and black was used for the sky. In the decorative borders that framed the compositions marbles of divers colors began to be employed at an early date. Later they found their way into the main compositions themselves and greens, reds, yellows and other colors, sometimes managed with striking effect, are to be seen in some of the work. Pinturricchio, with his passion for color, was especially given to polychrome treatment.

"The subjects were first silhouetted in white marble set into the background of black, or of black and colored, marble. Details were then wrought upon the white marble by engraving lines with a graving tool or fine chisel; next the lines were accentuated by dots or small holes made with a trepanning drill and then these incisions were filled up with mastic or stucco, in the manner already indicated, and connected so as to appear as one continuous line, thick or thin, as required by the design. There is comparatively little filling of extensive sinkages with mastic or stucco, and the marvelous result is compassed chiefly by adroit composition of the masses and by the nicest fitting of the whites into the black, or black and colored background. The work is virtually sculpture in two dimensions.

"The pieces of white marble forming the design in silhouette are not so numerous as one might at first imagine. In the earlier part of this *commesso* work, as the Italians call it, there is no attempt at shading through the use of graded hues of marble. It was not until the later stages of the process that this element of complexity was introduced, with a consequent loss of virility and directness."

Various mastics were used at different

times in the construction of these marble mosaics. In M. L. Booth's translation from the French of "The Marble Workers' Manual," he says: "The ancients, to collect their cubes, employed a mastic composed of lime, the dust of marble, and curdled milk or skimmed cheese, the sediment of which would form a line of the rich color given by the milk." Elsewhere it is stated that instead of milk the whites of eggs were employed. M. Ritter, in his "Collection of Swiss Antiquities," says that the cement of the cubes of an Avenchon Mosaic was composed of a paste of pulverized yellow stone and linseed oil, to which litharge was also sometimes added. The mastic used in the Cathedral of Siena in 1444 consisted of 60 pounds of pitch, 24 of wax and 10 of "bolo" —a kind of black bole or earth. For setting smaller tesseræ some authorities recommended oleaginous cements. Olive oil, wood ashes and quicklime were one recipe. In modern work, Portland cement is generally used for the foundation, the mosaic being bedded and jointed in ordinary mortar made with lime and sand.

The stone pavements we have just described are not confined to use with any one mode of architectural expression. Though this time-honored art was allowed to lapse almost into oblivion during the sorry days of the mid-nineteenth century, increasing attention has lately been paid, in the designing of public buildings, to the claims of the stone pavement, and we are beginning to emulate and sometimes surpass, in our mosaics the achievements of the past.

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The Mosque of the Barber, at Kaironan, has some marvellous marble mosaics in the walls and floors.

First Impressions

THE lobby of a theatre or a moving picture house is, in the public mind, an index to the character of that structure.

It is obviously important—nay, more, it is imperative—that this space be luxuriantly decorated, rich in color, and almost Sybaritic in its appointments.

No other material can so quickly—nor so surely—achieve this as does marble.

THE MONTANA STATE CAPITOL

Many Kinds of Marble Were Used for the Interior

THE State of Montana, self-styled "an international playground," is a new land awakening to the dawn of a new world market across the Pacific. Its 1924 corn acreage alone was 550,000, and it produced for the same year over 4,000,000 barrels of oil. Lumber cutting totaled nearly a half-billion feet and one-tenth the potential minimum hydro-electric power of the United States is found within its borders. But even this array of figures cannot give an adequate idea of the possibilities of the state, for it boasts of treasures yet untouched awaiting the men of capital and vision.

In keeping with the importance of such a rich area is the fine Capitol Building at Helena, Montana. This imposing structure lies in a basin surrounded by mountains on all sides. It faces the north, overlooking the ten-mile wide valley, and at the foot of the mountains lies a lake about two miles long, an arm of the Houser Dam. The capitol grounds consist of 12½ acres on the east side of Helena, with Sixth Avenue forming its northern boundary. The background of

stately mountains minimizes the size of the building itself, which is 464 feet in length with an average width of 130 feet. Its roof is some 90 feet above the pavement, and from its center rises a dome 165 feet high.

When Montana was admitted to statehood it was granted 182,000 acres of land by the Federal Government for building purposes, the income from which was used to defray the cost of the Capitol. The cornerstone of the original structure, which comprises the main body exclusive of the two wings, was laid on Independence Day, 1899, and completed in 1902. Bell & Kent, a firm long since retired from business, were the architects of this central portion. The architects for the new additions were F. M. Andrews & Company, of New York, and Link & Haire, of Helena. This later contract was let in November of 1909, and the two wings were occupied in 1912.

The style of the building is a mixture of Renaissance and a free version of the American Colonial. Three stories and a basement in height, the mass is dominated by the copper-covered dome, crowned by the Statue of Liberty. The base of this dome is square, with triple windows set in each side, separated by small columns and surmounted by a pediment. The main entrance, directly below, is marked by a portico with four Ionic columns, behind which is a fanlight on the level of the upper range of windows. The wings are distinguished by the Ionic columns extending through the two stories, in harmony with the entrance portico, but a distinctive touch is given by the pediments over the end win-

The Rotunda, looking toward the grand staircase.

The Main Hall and part of the Rotunda, showing a glimpse of the grand stairway on the right.

dows of the main floor, and the colonnaded parapets above the cornices. The approximate cost of the grounds and building, including paving and furniture in the main building, was $1,200,000.

At the eastern end of the grounds and to the rear are three smaller buildings, the nearest one used during the meetings of the Legislature as a dining hall for the accommodation of the members and visitors. South of this is the livestock building, first used in 1919, and costing about $40,000. Beyond is the $50,000 State Board of Health building, first occupied in 1920.

The principal interior feature of the State Capitol is the grand stairway leading from the rotunda on the ground floor to the floor above. This stairway is 14 feet wide with Vermont gray marble treads the full width and each in one piece. These treads, despite the wear caused by thousands of feet passing over them for more than a score of years, are in a wonderful state of preservation. The rotunda itself is very ornately decorated. The floor is of marble tile of various colors, arranged to form geometrical patterns. The wainscoting, pilasters and columns are of Royal Antique marble, the capitals being elaborately carved, of Corinthian design. From the center of the main floor rises the dome, richly lighted by stained glass windows, and portraying in its four pictures the characteristic types of early days: the Indian, the trapper, the miner who led the westward march and the cowboy. The trapper is the likeness of "Jim" Bridger, a pioneer of the west who is honored also by a portrait in the Colorado Capitol; the miner is Henry Edgar, famous in Montana, and one of the early followers of the golden trail.

All the corridors of the building are paved with marble. In the main structure, the field is composed of Riverside and the base of Verdosa. The wings show a different treatment, for in these the corridors

and entrance vestibules on the ground, first and second floors have marble floors with a gray Tennessee field and borders of Verde Antique and Pitts Valley. The tile are all sand finished, 9 by 18 inches, laid to a pattern.

The principal attraction on the ground floor of the main building is the State Historical Library, with about 20,000 volumes, including old directories, newspapers, maps and original manuscripts. A museum conducted by the Library contains an interesting collection of Indian relics, old guns, mineral specimens and articles used in a bygone era.

On the first floor are located the quarters of most of the elective officers, with the Governor's reception room in the east wing adjoining the Governor's office. This Elizabethan room contains a very fine marble mantel and hearth, in color a rich buff with white veining, the stone coming from a Montana quarry.

The second floor contains the Senate and House of Representatives, the Law Library, the Supreme Court and the Judge's office. The House of Representatives is in the extreme west end, and its marble treatment, while not in any sense the exact duplicate of that of the other rooms in the building, is fairly typical of the general scheme. Around the cement floor, which is hidden by carpeting, extends a border and 10-inch base of Verde Antique marble. Listavena marble is used for wainscoting, pedestals, pilasters, columns and trim for windows and doors.

The wainscot is built with three members —base, die and cap. The pedestals and col-

Former Senate Chamber, now the Supreme Court.

umn bases are solid stock, as are also the shafts of all columns. These monoliths carry the gallery and are some 20 feet high. The capitals are composition, with ornamental plaster cornices and beams—a treatment that is hardly consistent with the remainder of the scheme, but probably dictated by false economy. The entire ceiling of this room is skylighted with art glass, amber in color, set in wood frames, giving a subdued illumination of rare softness. A bronze railing forms three sides of the gallery, and is carried around the columns on the gallery side, giving them the effect from the room side of standing free. Under the railings is a mop strip of Verde Antique marble.

The Senate, east of the House of Representatives, contains many paintings commemorative of scenes and incidents in the history of the State. The Supreme Court opens off the balcony on the north side of the rotunda, and across the corridor from the Chamber of the Supreme Court of Justice is the Law Library, in the east wing. It is claimed that this collection of 38,000 volumes is not exceeded in extent and completeness by any law library west of the Mississippi River. The room runs through two floors and has a skylight its full length.

Throughout the building Tennessee gray marble was used for window stools, and the lavatories and toilet rooms are all wainscoted and partitioned with the same material. In the wings Verdosa marble was used for the base and striped Brocadillo was used for wainscoting and trim around the doors and windows.

Second floor corridor at the head of rotunda stairs,
Montana State Capitol, Helena.

Courtesy The University Prints, Boston.

Wing of Francis I, Blois Chateau.

THE STYLE OF FRANCIS I

Classic Elements Began to Dominate the General Composition of French Architecture

Part I: Blois and Chambord

THE works executed during the reign of Louis XII, as we showed in our last article, exhibited the same general aspect as those of the fifteenth century, but disclosed the encroaching influence of Italian detail and ornament. The style "charms by its picturesqueness, by its piquant combination of very dissimilar ideals, and by much beauty in its individual parts. It is interesting as illustrating the first effects upon architecture of a great moral crisis, but is too loosely compounded of discordant elements to be of permanent value from an artistic point of view." (W. H. Ward: French Renaissance Architecture.)

From early in the reign of Francis I, the Renaissance advanced with great strides. Art, science and literature were pursued with the greatest ardor and therein lies the true glory of his age; the sovereign power built up by his predecessors was used by him and his descendants for their personal

Illustrations, except the one shown above, courtesy Mr. Thomas Machen, architect, Baltimore.

View of courtyard and the famous stairway of the Chateau of Blois, in the Loire Valley.

enjoyment. Francis was a man of strong artistic instincts and he surrounded himself with men of letters and genius, such as Marot, Budé, Cellini, Rabelais and da Vinci. To these he gave encouragement, both financially and spiritually, and so set an example that was followed by his court. He did not confine his patronage, moreover, to men of his own country; his predilection was for Italian art, and his position as an Italian prince afforded him an excellent opportunity to favor the artisans of that country. He was constantly surrounded by Italian sculptors and painters, and he practically maintained, during most of his reign, a colony of them at Paris and Fontainebleau.

It was natural, therefore, that the characteristics of the new movement in Italy should appear with more and more frequency, and, before long, dominate France. This was especially true of architecture, since the building activity of Francis I was astonishing. Probably no other monarch ever attempted to erect so many palaces at one time. In the Loire section he built the greater part of the large Chambord Chateau, the north wing of the chateau of Blois, the castle of Le Lude, besides additions to other structures in the neighborhood.

Further north he remodelled the royal hunting castle of Fontainebleau and S. Germain-en-Laye and began the chateaux of Madrid, Villers-Cotterets (1532–50), Folembray, La Muette, Challuau and the Louvre, and his villa at Moret, this latter removed in the nineteenth century to the Cours la Reine in Paris. These are mostly later than Blois and Chambord. The court followers also chose the Loire Valley for their country sites and hotels. One of the earliest of the

fully Renaissance mansions was that at Bury near Blois, built by Florimond Robertet. It was probably designed by Fra Giocondo, although not commenced until about ten years after his return to Rome.

The country palaces and hunting lodges of the Loire Valley show a great diversity of plan and treatment. They prove the inventive genius of the French people, in adopting the spirit of the Renaissance while rejecting—or at least, disdaining—its formal canons.

The first in date of the buildings of Francis I is at the same time the most important and the richest in decoration. This is the north portion of the Chateau de Blois, the home of his wife Claude, the daughter of Louis XII. The initials of the king and queen were extensively used on the walls of the court and elsewhere throughout the decorations.

The staircase is of considerable interest. Though external stairways were frequent in Gothic times and later, none of them were nearly so elaborate as this one. It occupies what was once the center of the northwest side of the inner court (that is, the southeast side of Francis' wing). Octagonal in plan, it has five of its sides projecting into the court. A good description of this remarkable example of early French Renaissance is given by W. H. Ward, as follows: "The stone stair is carried up spirally on a continuous barrel vault. The outer shell is stiffened by radiating rectangular piers, treated somewhat after the fashion of a giant order. External balconies run from pier to pier, and the tower-like mass terminates in a flat-topped open lantern. In spite of the delicacy of the detail, the richness of the ornament, and the boldness of the main conception the design is not entirely successful. The difference in slope of the stairs at the various stories, the divergence between the rake of the ramped arches and that of the balconies, and the lack of relation between the tower and the adjoining elevation, tend to mar its effect. But, as seen from the cloister arcade, framed in gloom and bathed in morning light, it cannot fail to strike with wonder

Exterior detail of stairway, Blois Chateau.

Crown of the Grand Stairway in the wing of Francis I, in the Chateau of Blois.
Note the salamander, the royal emblem.

and admiration as an exquisite piece of jeweler's work on a monumental scale."

The French did not generally adopt the straight flights of the Italians for 100 years or more, the winding newel staircase being a Gothic tradition. The occasional exception, as seen in the stairway in the Chateau of Azay le Rideau, only served to prove the rule.

The façade of the court, to either side of the great stair, contained a rather low-ground story, a higher second story, another low story above this, and a high roof with elaborate dormers. A rich cornice and balustrade crowns the whole, the most curious member of which is the series of small arches enclosing shells. In places the carving stops abruptly, "as though the king had lost in-

terest in his work or the carvers had gone off elsewhere."

Most of the façades of the structures built in the Loire in first half of the sixteenth century exhibit the same general treatment. The windows have their sills formed by a horizontal string course, and above their heads runs another string course, or architrave. Between the two is a space that is treated as a deep frieze. Pilasters are placed in some cases one on either side of each window, in other cases singly between windows. Both plain and paneled pilasters are used, and short ones connect the entablatures formed by the string courses. A continuity of upright lines is given by shallow ressauts at Blois. Here, too, the windows have their mullions and transoms square

Early Renaissance details of one of the chimneys in the wing of Francis I in the Chateau of Blois.

The carving on the façade of the Blois Chateau stops abruptly in places.

and unmoulded, but with the center sunk to form panels.

The salamander of Francis I is carved on all buildings erected by him and sometimes on those built by his courtiers. It is generally shown in the midst of flames and with a crown upon or above its head. Its existence only proves that the building was erected in Francis' reign. At Blois, the outside staircase is particularly rich in these animals and crowned F.'s. The C. for Claude is also seen as well as the swan pierced by an arrow, the distinctive emblem of the queen.

Strangely enough, the four vast piers that rise like buttresses to support the stairway show on their faces corbelled niches containing statues and surmounted by canopies in the late Gothic style. Gargoyles, too, project from various stages of the staircase, as well as from the cornice of the building itself. The persistence of the native French habits of design gives to this work a mediæval aspect, in spite of the presence of Italian Renaissance details combined in new ways.

Within the stairs one can appreciate more fully the delicacy and fullness of the decoration. There is a charm about each arabesque and slender shaft, each monogram and carved boss. The steps, like shell-lips, curve about the newel, rising upward to the fan-like vault at the summit, as if suggesting an almost effortless ascension.

The north side of the Blois wing consists of two tiers of arcaded loggias, built in 1524 and 1563, above which is a third gallery covered by an extension of the main roof, carried on short round columns. Superimposed pilasters are set in pairs where the

The arch-enclosed shells in the cornice of the Blois court is typical of the early Renaissance in France.

Façade of the north front, Chateau of Chambord.

width of the solid permits, and single ones are used on the narrow piers. The lower walls are battered and spurs support tall pedestals which in turn support the pilasters of the lower order. The loggia at the top is probably a feature borrowed from the Florentine palaces. The shape of the ground permitted the introduction of an additional story below the eastern portion and the height of the blank wall at the base adds dignity to a very striking façade.

The floors of the suites of rooms were all tiled, though today all of these are restorations. The designs for the most part were very successful, with blue and white interspersed at times with yellow. The interior was probably never as snug as that of the later English houses, but these tiled floors certainly possessed many advantages in a climate as warm as that of the Loire Valley.

One of the most interesting of the royal chateaux is Chambord. This strange edifice, begun in 1519 on an elaborate scale, "resembling in plan a feudal castle with curtain walls, bastions, moat and donjon, is in its architectural treatment a palace with arcades, open stair towers, a noble spiral staircase terminating in a graceful lantern, and a roof of the most bewildering complexity of towers, chimneys and dormers." Viollet le Duc aptly remarked that "Chambord est au château féodal des XIII^{e} et XIV^{e} siècles ce que l'abbaye de Thélème est aux abbayes du XII^{e} siècles: c'est, une parodie." (Chambord is to the feudal castles of the thirteenth and fourteenth centuries

The motley, though picturesque, conglomeration of chimneys, dormers and lanterns on the roof at Chambord.

what the abbey of Thélème is to the abbeys of the twelfth century: that is, a parody.)

This extraordinary edifice is usually attributed to Pierre Nepveu, who was then called only by the title of "master mason." It was intended as a pleasure house and hunting box for the king in the forests of Sologne, on a site that was nothing more than a swampy clearing in the woods. The round towers at the outer corners were repeated in the four towers that flanked the square donjon, each angle of which formed an independent suite, with the intervening space forming a Greek cross-shaped Salle des Gardes, or reception chamber—an arrangement that was used on each story. Partly filling the intersection is the famous spiral stairway, a circular double flight arranged around a hollow newel. These stairs start from opposite sides and are enclosed in a stone shell decorated with pilasters, the whole so built that people could "pass from one floor to another without either meeting or seeing one another, except for chance peeps they might obtain through the openings in the wall surrounding the well." Above the level of the balcony flat, the well is domed and a newel staircase leads to the lantern, a high and graceful stone creation, circular in plan and terminating in a fleur-de-lys finial.

The exterior walls are divided by orders of pilasters, with their entablatures, one order to each story. The Corinthian style is

used, but each capital is of a different style. The wall openings are of varying sizes and the cornice of the donjon portion is surmounted by a balcony.

This north front easily dominates the picturesque pile, with its wealth of ornamental features and its confusion of roofs. Simpson comments on it as follows: "Probably no building in the world presents so varied and broken a skyline as the central block of Chambord. Running all round, above the second story, is the peculiar cornice [the arch-enclosed shell form mentioned previously] described later, and a balustrade. Behind the latter is a flat, from which start the upper walls of the towers and other portions, all of which are set back several feet from the face of the wall below. The towers are crowned by conical roofs, each with a lantern at the summit, and very steep-pitched roofs cover the other buildings. Rising out or breaking into all the roofs, are numerous lofty dormers and chimneys, elaborate in design, and enriched by carving and other ornamentation. In the center of the flat is the cupola over the main staircase, with its flying buttresses and lantern carried high above everything else. The display is bewildering, and is evidence of the originality and abandon of the men who designed and carried out this important building."

Detail of the lantern of the Grand Stairway, Chateau de Chambord.

THE FEDERAL RESERVE BANK OF RICHMOND

The Mausoleum at Halicarnassus Probably Served as Its Model

IT will be recalled that it was during the troublous times of 1914, shortly after the beginning of the great war, that this country decided to open the Federal Reserve Banks. The need for these institutions was so pressing, the emergency so great, that the authorities had but scant time in which to make a selection of quarters suitable for occupancy, and were compelled to take whatever locations were available and best adapted to their purposes. The erection of new buildings was out of the question; and even the old buildings selected for the banks renovated with the greatest expedition.

In line with this hurry-up policy, the Federal Reserve Bank of Richmond rented the National State and City Bank Building at 1109 East Main Street which had been formerly occupied by the older institution and still contained some of its fixtures. By working day and night, this structure was ready for occupancy by November 14, the day set for the opening of all the Federal Reserve banks. The Richmond branch was, in fact, the first to notify the Secretary of the Treasury that it was open and ready for business.

In the beginning it had twenty employees. In one year's time the working force had grown to sixty-three; by the end of the second year, to 125. The adjoining building at 1107 East Main Street was rented. The expansion continued, so that by the latter part of 1921 the force was scattered over five buildings and numbered 541. It had become apparent as early as the beginning of 1917 that the bank must take steps to build a home large enough to allow for its very rapid growth. The directors therefore appointed a building committee consisting of George J. Seay, Governor; Caldwell Hardy, Federal Reserve Agent; and Colonel John F. Burton, a director. This committee was authorized to employ an architect to prepare plans for a suitable building. A lot at the northwest corner of Franklin and Ninth Streets was secured, on the slope of a hill, a site in the heart of the financial section, and convenient to the main post office—an advantage of considerable importance in the execution of its work for the hundreds of member banks throughout its territory.

A selected group of architects were invited to submit designs for a competition conducted under the rules of the American Institute of Architects, the program being prepared by Mr. Waddy B. Wood, F.A.I.A., of Washington. Eight firms submitted designs, and the winner was Sill, Buckler and Fenhagen, of Baltimore. Arrangements were completed with the contractors, not upon a "cost-plus" basis, as has been stated so often, but for a flat fee, and the various features of the work were let out to subcontractors upon competition.

Owing to the entrance of America into the war about this time, it was felt that the immediate erection of the building should be postponed—that all the energies of the nation should be devoted to winning the great conflict, and only absolutely essential construction work should be carried on. No active steps were taken, therefore, until June 2, 1919, when the ground was broken

Illustrations courtesy Buckler & Fenhagen, architects, Baltimore.

The Federal Reserve Bank of Richmond, Virginia. Sill, Buckler & Fenhagen, architects.

A glimpse from the lobby, past one of the marble columns, into the central banking space.

for the main bank building. The disturbed conditions incident to transition from war time to peace time were responsible for much difficulty in obtaining material and the many strikes that occurred; so that, while it was expected to complete the building in fourteen months, it finally required nearly two and a half years.

Shortly after construction work was started it became apparent that the proportions of the building would not meet the volume of business being done by the bank, especially since additional activities had been imposed upon the Federal Reserve system. These new duties consisted chiefly of the collection business of the country. Provision was made for expansion by the acquisition of the lot immediately in the rear of the bank proper, and an annex was begun on January 5, 1921. Some idea of the magnitude of the business done by this Richmond bank may be gleaned from the following facts: On the day the new building was occupied, over $100,000,000 in securities were

moved from the old home at 1109 Main Street to the new quarters, the greatest single movement of valuables ever known in Richmond. Several millions in cash and bonds had already been transferred to the new vaults from two other local national banks. During the year 1920, there was handled a daily average of 110,960 checks, amounting to $37,848,000. The resources of the Reserve Bank are much greater than the combined resources of all the banks in Richmond.

The exterior of the main building is a free adaptation of the Grecian style and expresses the salient characteristics of the plans from which it was developed. If one were to select one of the Grecian structures that served the architects as the probable model for this monumental and dignified composition, it would no doubt be the great Mausoleum at Halicarnassus. The two resemble each other in the placing of a colonnade of huge Ionic columns above a high and simple base. Here, however, the semblance ends, for the low projecting side wings resemble nothing at Halicarnassus, and the upper story, like a smaller temple perched independently atop of a precipitous cliff, certainly has no prototype in Hellenic architecture. But even under the much-altered conditions of modern requirements it is readily apparent that the Grecian style had been a guide and an inspiration.

"The general mass of the building," wrote

General view of the main banking room, looking toward the rear. The floors, columns and counters are of Tennessee Pink marble, carefully selected.

One corner of the rear of main banking room, showing a portion of the marble counters.

Governor Seay, "was really suggested by a clause in the competition program which required that no part of the space devoted to offices should be a greater distance than 25 feet from direct light. If office space was to be secured unbroken by courts, it was evident that the upper part of the building must not exceed 50 feet in width. The great banking room on the first floor required all the space available on the lot, but the same light requirement was maintained by introducing clerestory windows for the central space and additional windows for the projecting side aisles. So it was that this simple

The officers' quarters on the first floor, to the left of the main banking room.

clause determined the form of the building.

"The granite base and the broad carved bank just above were designed to offset the effect of the sloping line of the sidewalk and form a level base on which the building proper would rest. Two carved marble pedestals will later be placed on either side of the main entrance. The sixth story was not a part of the original design, but was added later to meet the increased requirements of the bank.

"The banking room is entered from an ample vestibule, the floor of which is four steps below the first floor level, making a

Looking through the majestic marble columns from the mezzanine to the main floor below.

dignified approach to the large room. To the left is located the Governor's office, and on the right that of the Federal Reserve Agent. Conference room, library, stairway and elevators are at the rear. The greater portion of the first floor is occupied by the banking room, which is 73 feet deep, 82 feet wide, and practically two stories high. The clerestory walls are supported by massive Doric columns of Pink Tennessee, which in their proportion and detail suggest those used in the Temple of Eleusis. Great care has been taken in selecting the marble used in this room to secure a uniform color.

"Above the main entablature are terms surmounted with female heads which support the slender clerestory cornice directly under the ceiling. These heads were carved after a model made by Hans Schuler, the sculptor, being a free copy of an archaic Greek head found at Athens. The two large panels on the same level, one over the main entrance and the other directly opposite, over the small gallery, have been reserved by the bank for future carving in bas-relief of similar character. The ceiling is an adaptation of Renaissance design frequently found in ceilings of earlier Roman basilicas, but with Greek detail used in the ornament of its coffers."

The floor throughout the whole of the main banking room and in the basement is Pink Tennessee marble, and the same material has been used for the heavy counters that form an inclosure in the center of the large chamber. The absence of the usual banking screen and partitioned offices is noticeable, and the feeling of openness achieved by this treatment is perhaps the most striking feature of the interior. Beyond the huge marble columns and separated by low marble rails are the offices of the bank officials. The floor inside these quarters is marble terrazzo with broad strips of Tennessee separating each of the spaces. Beneath the windows are radiators framed in panels of this same kind of marble. Other officers are placed in the island in the center of the main floor. The rooms occupied by the Governor and the Federal Reserve Agent follow closely the work of the Adam brothers, noted English architects of the eighteenth century, and these rooms are naturally of a more domestic character. Conspicuous among the other features are the fireplaces of white Italian marble with panel trims of Breche Violette.

Both in the main building and in the annex, many new, practical and efficient methods of handling routine work have been designed and installed. Fireproof safes have been installed under desks throughout the various departments where all records of each department are housed.

The vault was designed to be proof against the strongest attack. It is three stories high, with its lower floor considerably below the sub-basement. The main door with its frame weighs 63½ tons, and has 24 bolts each weighing over 100 pounds. The door itself is said to be one of the heaviest castings ever made for such a purpose.

The annex building is much simpler in design than the main building and is without any special architectural features, though it is of highly pleasing appearance harmonizing with the style of the main building. The interior is given over entirely to the working force of the bank, the officers and executive force being located in the adjoining structure.

The marble fireplace in the Governor's room in the Federal Reserve Bank of Richmond.

THE MUNICIPAL BUILDING AT WATERBURY, CONNECTICUT

THE early New England settlers, who conquered that rugged country included in what is now Massachusetts and Connecticut, left their noble ideals and cherished traditions indelibly stamped upon that section. Their environment, remaining unchanged for so many years, molded them into a frugal and dignified people, ever prosperous.

As they prospered, so they built; plain and without ornament, but correct in proportion. Whether in the home or in the church, these forefathers of our nation built with such adherence to good principles that they developed a type of architecture, today called Colonial, that is admired throughout the country.

Not only is Colonial architecture beautiful, but its style is such that modern architects can readily combine its excellence with those other desirable qualities demanded by the present generation of builders—stability and maximum efficiency. This being an efficient age, anything which tends to curtail

the largest possible production is likely to be left behind, and this problem of efficiency bears heavily on the field of architectural designing. Both private and public buildings are often robbed of beauty to satisfy the ever-increasing demands of business. Good design and workmanship are too frequently sacrificed in the race to save time.

Such was the problem which confronted the citizens of Waterbury, Connecticut, when they decided to build a new city hall. Modern efficiency was the keynote. In this one building were to be placed the offices of the various city officials together with the fire and police departments. To combine these widely differing elements under one roof, yet keep them from encroaching on one another, was the architect's problem. The Municipal Building as it stands today is Cass Gilbert's solution of it. It is an example of architecture that embodies all the traditions of its location, besides being a successful effort in combining practical designing with attractiveness. It represents utility, stability and beauty. Its walls have been enriched with the permanence, as well as the glowing life of the marble quarries.

The exterior of the building is an artistic combination of Vermont Imperial Marble with brick, the design being distinctly Colonial in type. The first story is constructed entirely of marble, and the upper stories are set off by a series of marble pilasters which, combined with the marble cornice and window trim, admirably emphasize the brightness and correct proportions of the lower

One of the entrances. The walks, fountain, urns, steps and balusters, as well as the lower walls and pilasters are of marble.

The grand staircase—"a spacious marble ascent."

courses in a manner that produces a very effective mass. The building stands about 80 feet from the street and the frontage is ingeniously broken up with brick and marble paths which, just before reaching the entrance steps, converge on, and encircle, a white marble fountain. Smaller fountains, urns and shrubbery flank either side of the main entrance, which is further enriched by the heavy carved marble balusters, low but dignified. A balustrade, similar in design, is carried completely around the roof, softening the otherwise severely horizontal skyline of the structure. Marble medallions between the pilasters at the ends replace the third floor windows.

The same thought of simplicity is carried out in the interior. The walls of the main corridor as well as the floors are of Vermont Light Cloud marble. The grand staircase is a spacious marble ascent leading to the second floor corridor where the design is

further augmented by a very effective treatment of marble pilasters and wainscoting. Some of the administration rooms are the results of special study to achieve real efficiency without losing the artistic effect. This scheme has been successfully accomplished by finishing many of them partly in marble in accord with the general design. The interior plan of the building meets entirely the requirements of modern administration without violating the best principles of good architecture. It is emphatically practical yet not at all commonplace.

The completion of this city hall provides the citizens of Waterbury with a structure which symbolizes the ideals and traditions of a race of hardy, upright people. They have generously responded to a present need and have anticipated those of future generations. The atmosphere created by buildings of this stamp is an influential factor in toning up community ethics and civic pride.

Entrance detail, Waterbury (Conn.) Municipal Building.

A LIST OF THE WORLD'S MARBLES

By J. J. McCLYMONT

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

GROUP A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

GROUP B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

GROUP C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

GROUP D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

Noir Veini

Black Spanish or Spanish Black, Bilboa Black or Vizcaya Black.
From the Manaria Quarries near Bilboa, Province Vizcaya, Spain.
Deep black interlaced with numerous white veins and markings.

Nonette

Quarried at Nonette, Auvergne.
Pearl gray with fossils. (Blagrove.)

Nord Marble—See Gandrieux, Glageon and Grand Antique.

Nordland Marbles

Antique Fonce	Cirton Furuli
Breche Rose	White Salten

Norge Clair

Quarried in Norway.
This is probably the same as White Salten.
Pure white.
Renwick lists this marble, but gives no quarry location.

Norite

Differs but little from Gabbro.

Norrkoping—See Ringborg Green.

North Carolina Marble

The only marble now being quarried in this state is the Regal Blue, at Regal, Cherokee County.

North Carolina Serpentine

Near the city of Asheville are undeveloped deposits of serpentine.

Northern Pentelic—See Pentelic White Statuary from the Dionyos Quarries.

Northern Pentelic

Name by which Pentelic is sometimes known.

North-West Frontier Province Marble—See Nowshera.

Norwegian F. O. or F. O. Norwegian.

American name for a Norwegian marble, probably White Salten.

Novara Province Marble—See Candoglio.

Novelda—See Rouge Clair.

Nowshera

Quarried at Nowshera, Peshawar District, North-West Frontier Province, India.

Red with a profusion of white calcite veins and patches. It contains indistinct signs of fossils. (Watson.)

Another variety described by Watson is the same as the other except that light pink takes the place of the red.

Nuageux—Cloudy.

Nube—Cloud.

Nuit St. George—See Rose St. George.

Numidian Marbles

According to Playfair, the name Numidian is incorrect as the marbles are not found in Numidia proper, but in the ancient provinces of Africa and Mauretania, now Algeria, Morocco, and Tunis. The only known quarry in the ancient African Province of Numidia is at Fillfila, where a white marble of ordinary quality is found.

The marbles now known as Numidian are quarried at Kleber, on an elevated plateau known as Djebeler-Roos or Mountain of the Capes, commonly called Montagne Gris, about twenty miles northeast of Oran in the western part of Algeria and near Simittu Colonia, modern Chemtou, in the Medjerda Valley, Tunis.

Numidian Pavonazzo or Pavonazzo de Numide—Group D.

Kleber Quarries, near Oran Province, Algeria.

Resembles the Numidian Rose, but the color is more evenly distributed. It is intersected by numerous chocolate colored veins.

Takes good polish.

Numidian Pink or Rose de Numide—Group D.

Kleber Quarries, Oran Province, Algeria. Coral color with rose colored clouded bands traversed by purple and rich brown threadlike markings.

Another variety is same with pink bands less defined. The slender markings are more numerous and are entirely brown.

Takes high polish.

Numidian Red or Breche Sanguine—Group D.

Kleber Quarries.

Deep red, bright red and occasional yellow fragments with deep purplish red and brown connecting.

Takes high polish.

Numidian Yellow or Giallo Antico—Group D.

Quarried near Chemtou, Tunis, Africa.

Warm yellow often tinged faintly with pink and streaked with marking of brown. (Elsden and Howe.)

This quarry ceased to be worked with the downfall of Imperial Rome and its loca-

tion was unknown for many centuries. According to Watson it was rediscovered when the railway between Algeria and Tunis was under construction.

Edward Dow, American Consul at Algiers, advises, May 29, 1923, that the quarries are not operating.

Numidian Yellow or Giallo Antico—Group D.

Kleber Quarries, Oran Province, Algeria.

This marble is almost identical in color and texture to the Numidian Yellow from Tunis.

Nuvolato—Cloudy—See Giallo Antico Nuvolato.

Nuvolato Bruno Alabastro

Same as Alabrasto Nuvolato Bruno.

Nuvole Alabastro

Same as Alabastro Nuvole.

Nuvoloso—Cloudy

Nuvolosa di Arno

Quarried near the banks of the Arno, Italy.

Pale green with spots of clear yellow or greenish-yellow. (Blagrove.)

Nuvoloso di Mugnione

Quarried near Mugnione, Tuscany, Italy.

Reddish-gray. (Blagrove.)

Nyasa Lake—See Steatite (Central Africa).

Nymph's Grotto

The ancient quarry that produced Parian Marble was known as Nymph's Grotto.

Nyvert

Same as Swedish Green.

Oaxaca—See Mexican Onyx.

Obscur—Cloudy.

Obscurite—Dark.

Obscurite Bruno—Dark brown.

Occhi—Eye.

Occhiato—Italian name for full of eyes.

Quarried at Mora, Venetia, Italy.

Violet color with round fossils closely placed. (Blagrove.)

Occhio—Eyes.

Occhio di Pavone

Quarried in the neighborhood of Verona, Italy.

Red, inclining to yellow, in which the shells form large orbicular spots of red, white and yellow. An ancient marble by the same name is similar.

Occhio di Pavone—Eye of the peacock.

An ancient marble from an unknown quarry was known by this name. This particular marble was very similar to Modern Griotte marble. Other varieties of marble, presumably from the same quarry, were—according to Pullen—as follows:

Occhio di Pavone Bruno

Is brownish-red.

Occhio di Pavone Pavonazzo

Brick-red peppered with pearly-white

fragments, oysters transparent, crystallized, and yellowish, with white arcs and suspicion of violet brown.

Occhio di Pavone Rosso

Red, with round or oval shells changing into white or two shades—brick-red with streaks of white and spots of pink.

Occhio di Pavone Scuro

Purple, with numerous shattered fragments of white.

Occhio di Pavone Verddognolo

Same as last with tinge of green.

Occhio di Pernice

Brick-red with drab and red dots or violet with lines of yellowish-white lichen of yellowish-green and inconspicuous eyes.

Occhiodino

Quarried at Cerveno and at Bordogna, Italy.

Violet filled with small round fossils. (Blagrove.)

Occhiuto Alabastro

Same as Alabastro Occhiuto.

Oeil de Perdix—Partridge eye.

Griotte d'Italie and other varieties of Griotte marble are sometimes found with an abundance of small pearly white spots. They are known as "Oeil de Perdix."

Ogwell Quarries—See Gray Ogwell and Red Ogwell.

Ohio

No marbles are found in the State of Ohio, but gypsum occurs in certain districts.

Oklahoma Marble

Quarried near Marble City, Oklahoma, and formerly known as Cherokee marbles. Several varieties of gray and pink were formerly produced, all of which took a good polish. Quarry is not producing at present. This quarry was opened about 1896 and was operated from time to time until about 1912. The output was also known as Ozark Gray, Ozark marble, and Ozark Pink.

Old Convent Quarry

This well-known Siena quarry was owned and operated by the Monks of the Old Convent at Monterenti, Italy. The original opening on the side of a cone-shaped hill produces the following marbles: Siena Old Convent Yellow or Brocattelo, Siena Silver Gray, and Siena Silver Gray mixed. The new openings on this hill, of which there are three or more, produce the Siena Monterenti and Siena New Monterenti.

Old Convent Gray Siena—See Siena Old Convent Gray.

Quarried at Monterenti, Italy.

Old Convent Siena—See Siena Old Convent Gray, Brocattelo, Gray Mixed and Yellow.

Old Convent Siena Brocattelo—See Siena Old Convent Brocattelo.

Oletta Marbles

Quarried near Oletta, Corsica. Of three varieties: One, dark red with white and

sometimes yellow veins; another, yellow mingled with shades of red, white and gray; a third, blackish with small white or brownish veins. (Blagrove.)

Olive—Group D

Quarried at Swanton, Vermont.

Light faintly greenish ground, inclosing very irregular lenses or elongated cones more or less parallel, some of them brecciated—of light pinkish-gray color. (Vermont State Geological Survey.)

Olivo—Group B

Quarried at West Rutland, Vermont.

White with olive or yellowish-green veins in cloudy, feathery forms.

Blocks are not usually large—comes in slab form only.

Omeo Township—See Limestone River.

Ondato Cippolino

Same as Cippolino Greek.

Onde—Wave.

Oned Meliz

Numidian marble from the Chemton Quarries (see Numidian Yellow).

Shipped from this station on the Algeria and Tunis Railway.

Onhaye

Quarried near Onhaye, Namur, Belgium.

Brownish-black, mingled with paler shades with spots and veins of gray. (Blagrove.)

Onice Alabastro

Same as Alabastro ad Onice.

Onichino Alabastro

Same as Alabastro Onichino.

Onichino Alabastro Fiorito

Same as Alabastro Onichino Fiorito.

Onichino Alabastro Rossastro

Same as Alabastro Onichino Rossastro.

Ontario, Canadian Marbles—See Banded Pink, Breche Rose, Byzantine, Cippolino Green, Imperial Green, Laurentian, Pink Clouded, Veined White.

Onyx

True Onyx is a quartz or agate, generally chemically treated, and is not used as an ornamental building stone. Onyx, as known to the trade, is what is technically known as Onyx marble, because the stone is chemically the same as many marbles and the colors are generally banded as in Onyx. Hence, it possesses some of the characteristics of both. Onyx or Onyx marble occur on the floors of or what was a cavern. Some of the Onyx in use is not a floor or stalagmitic deposit, but is a stalactite from the roof or sides of caves, and is known as Cave Onyx. The manner of deposition of Onyx is much more simple than that of most any rock. Spring or rain water passing through clay gathers carbonic acid, which gives water the ability to attack and absorb lime from the overlaying bed of limestone through the crevices of which the water filters its way gradually, enlarging the cracks and thus forming caves. According to Greek legend, the origin of Onyx was due to Cupid having cut the nails of the Sleeping Venus with his arrow; these, falling into the Indus, were changed to Onyx. Travertine or Travertine Onyx is formed by deposits from deep-seated hot springs, and differs from Onyx only in the manner of deposition.

THROVGH THE AGES

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Main Banking Room of the Pennsylvania Company in the Packard Building, Philadelphia.
Ritter and Shay, Architects.

THROVGH THE AGES

A Monthly Magazine devoted to the uses of Marble - its universal adaptability, beauty, permanency and economy.

VOL. 3 DECEMBER, 1925 NO. 8

COLUMNS

Their Use a Factor in Architecture From the Earliest Times

THE oldest known column in the world is that discovered by De Morgan, in 1894, at Abusir, near Cairo. Incidentally, it is the most beautiful of its type. The mastaba, or monumental tomb, in which it was found was proved by its inscriptions to be that of a certain Phtah Shepses, minister of public works to Sahura, the great king of the fifth dynasty. The capital of this column is of the lotus-bud type, and the base is the flat, bevelled disc common to early Egyptian architecture and found also at Tiryns, in Greece.

The next oldest column is that of Beni Hassan, dating from the eleventh dynasty, some 500 years later than the Abusir period. The shaft here is still monolithic, but the capital has lost a part of its delicacy and naturalism, and the proportions are poorer. The change to a conventional architectural member is beginning to be apparent.

Certain columns found at Bubastis (the capital of one of these is now in the Museum of Fine Arts in Boston) follow in chronological order; and next come, after a period of arrest of some 500 years, the examples of the eighteenth and succeeding dynasties. These show all the types except the bell column—the lotus, the pro-Doric, the palm leaf and the Hathor. The buildings of the early empire had been from the limestone hills that line the Nile, and nothing less than monoliths would do for the shafts. This material allowed of easy carving. The builders of the twelfth dynasty were more ambitious and employed the red granite of Syrene at the first cataracts. But when the Ramessides built their huge constructions and it came to the question of columns 60 and 70 feet high, as at Luxor or Karnak, drums were laid one upon the other.

"The archetype of all Greek buildings was the temple," said W. P. P. Longfellow. Columns were first added at the ends and afterwards the sides, and this form set the style for all time. At first built of wood, it was only a short time before marble came to be the preferred material. When the Etruscans fell heir naturally to Grecian architecture, they preserved the ancient form of the temple. They were not brick builders, but workers in stone.

The Romans accepted the order and added to it the arch. The early Romans, building their city in alluvial regions, and being little

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Marble columns in the old Roman bath at the Queen of all the Spas—Bath, England.

more than a community of needy outlaws, naturally turned to brick. However, in spite of Augustus' boast that he found a city of brick and left one of marble, we know that not all the temples were built of brick. Even Tarquin's Cloaca Maxima is arched in Travertine and Metellus built a marble temple as early as 140 B.C.

After Augustus' time, the art of building outstripped that of the Greeks in quantity and magnificence—and through it all the column of marble played an all-important part. "The civic buildings, and even private, far outshone the temples," says Longfellow. "Streets lined with porticos, arcades above arcades, rank over rank of columns, houses in so many stories that in Rome their height had to be restricted by law, took the place of the low-brick and unpretending towns of the early Greeks."

In 91 B.C., Lucius Crassus was made an exalted official of the Roman Republic. Like many another office-holder before and since his time he considered it proper that his residence should be made to reflect his advancement. In looking about for suitable materials he discovered, within the borders of Greece, six marble columns which were exactly what he wanted for the atrium of his house on the Palatine.

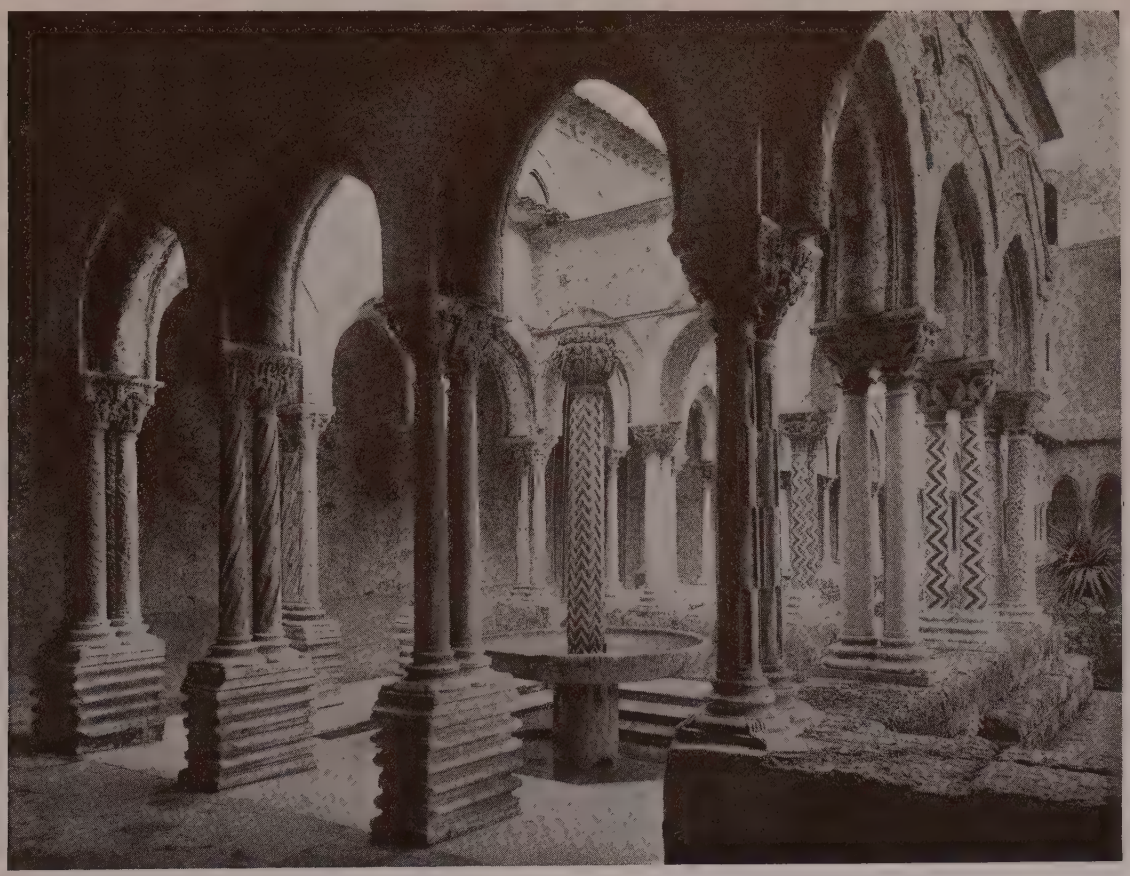
With true political sagacity he reasoned that it would be unwise to transport them

at once to the house of Crassus. He knew that many people in Rome were blindly opposed to luxury in private residences. When the monoliths arrived at Rome, therefore, he had them placed in a temporary theater as a decorative feature of the stage. Some weeks later they were moved away to be reset in the Crassus home. These pieces, it is claimed, were the first columns of Hymettian marble to be imported into Rome.

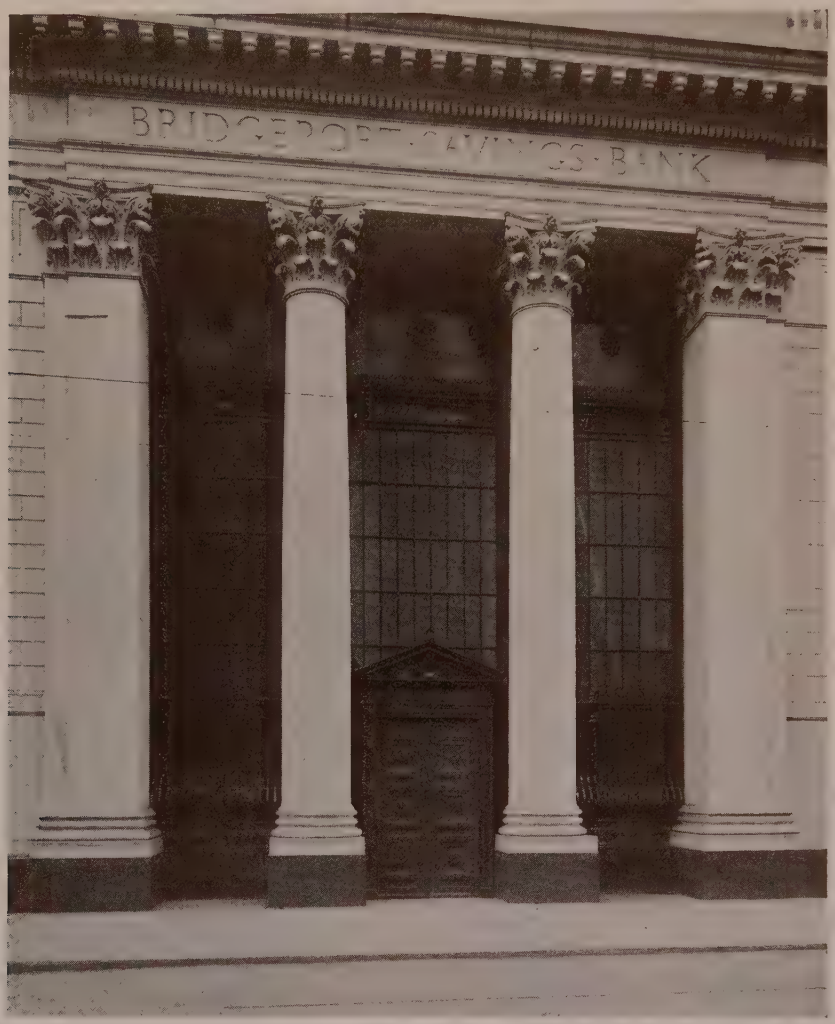
Thirty years later, another official, Aurillius Scaurus, profited by Crassus' example and placed 300 imported columns of black marble in another temporary theater. They remained there nearly a month. Then they, too—or at least the largest of them—were carted off to the Palatine to serve as an embellishment of the Scaurus mansion.

In a most interesting little book, "What Rome Was Built With," Mary Winearls Porter tells something of the Roman passion for marble. She goes back to Pliny for a description of this theater where the marbles of Scaurus were tentatively displayed. "It consisted of three stories; the first was of marble supported by 360 columns of marble between which were placed 3,000 brazen statues. The second story was of glass, a piece of luxury, says Pliny, which ever since that time has been quite unheard of; and the third of gilded wood. This theater accommodated 80,000 people.

"So great were the masses of marble carried through the streets of Rome for Scaurus' private house that the contractor for the public sewers compelled him to give



Arabian style columns of marble in the cloisters of the Church of the Benedettini, at Monreale.



The two monoliths of Vermont marble in the entrance to the Bridgeport Savings Bank, Bridgeport, Connecticut. Cass Gilbert, Architect.

security for the possible damage that might be done in the carrying of the columns to the Palatium."

In this volume it is related also how Mamurra who dwelt on the Cælian Hill was the first person in Rome to cover the whole of his walls with marble and to erect solid columns of Carystian or Lunian; how Sylla pillaged the columns of the Temple of Olympia Jupiter at Athens and transported them to Rome; and how Malatesta hauled 100 loads of marble from Ravenna for the enrichment of his own temple at Rimini. "Every building of any importance or pretense glistened within and without with columns, walls, statues and pavements of exquisite and rare marbles, hardly any other method of decoration being known.

Cæsar, either for effect or through a sincere belief in democracy, levied a tax on every column of foreign marble that came into Rome. It would seem, however, that this law was not long in force. In Cicero's letters to Atticus there is a reference to some newly acquired columns. "You may perhaps find," he writes, "that I am not

liable to the pillar tax. I think I was told by Camillus that that law had been altered."

It was Augustus who opened wide the doors. By way of example, he surrounded his house with columns of Lapis Albamis, and with pavements of choice marbles. Tibullus claimed that the excessive transport of marble crowded the streets of Rome with drays and carts laden with columns.

To quote again from Mrs. Porter's book: "The quantity, beauty, and endless variety of magnificent marble still remaining in Rome, causes us to wonder of what that city must have boasted before undergoing 2,000 years of plunder, havoc and change. At the present day 9,000 whole columns of marble have been enumerated by Lanciani, 390 of which he himself has brought to light. He estimates the number of columns landed at Ostia in ancient times to be 450,000 at least and says there is no fear of exaggeration in this estimate, considering the amount of destruction, of breaking up and of burning into lime that has been accomplished in Rome since the fall of the Empire; and columns represented but a small item in the marble trade of that city."

Two things therefore are apparent. Not only has the column enjoyed a long and honored history, but it has come into being largely by way of the marble quarries. As far back as 530 B.C. when they were rearing

Rough marble blocks quarried for the columns of the Bridgeport Savings Bank, Bridgeport, Connecticut. Cass Gilbert, Architect.

Columns of Georgia marble in the façade of the New York Stock Exchange.
George B. Post & Sons, Architects.

the Temple of Apollo at Delphi, a structure which was to have been built entirely of local stone, the contractors, so Herodotus tells us, won considerable fame by substituting marble for the columns of the façade and making no claim for the additional expense.

Even before the recognized beginnings of architecture, men were striving for the column effect, by raising inverted tree trunks or trees hewn into some semblance of this

form. Sometimes they used a crude pillar of rock which in some way they had pried out from the ledge.

As time passed the skill of the old builders gradually increased until it culminated in the beauty and perfection exhibited in the Greek and Roman architecture. Since that time, men have been unable to surpass the ancient standards of design, and consequently we find modern architects including in their structures the delicate, yet sturdy, effect of the column in both exterior and interior work.

The marble industry in America has advanced along the lines of efficiency to such an extent that American architects cannot design a building so grandiose in conception but that the quarrymen and finishers are ready and willing to carry out their part of the work. Great blocks are quarried and finished in single pieces for our public and private buildings. Nothing like them can be found abroad unless we go back to those mighty builders of old.

In producing the marble for the exterior of the Bridgeport Savings Bank, Bridgeport, Connecticut, a quarry in Vermont was called upon to get out some of the largest blocks in the history of the industry. Two great blocks were raised to make the columns for the entrance, one weighing fifty-five tons and the other fifty-two tons. When finished and on the cars ready for shipment, these huge monoliths measured

Huge columns of Botticino marble in the Telegraph Building, New York. Welles Bosworth, Architect.

nearly 30 feet long and over 4 feet in diameter. In connection with these columns, two of the largest caps ever cut in Vermont marble were supplied. Each contained 117 cubic feet. The pilasters which were provided for the front of the building were made up in three sections each containing 116 cubic feet of stock. Today these two immense columns with their gigantic Corinthian caps, flanked on either side by marble pilasters, make an imposing and fitting entrance for this large bank.

In both public buildings and memorials we find marble columns enhancing the artistic effect, as in the G. A. R. Memorial, Topeka, Kansas, with its six fluted marble pillars supporting the loggia; and in that glistening shrine, Benedict's Monument to Music in Roger Williams Park, Providence, Rhode Island, in which the capitals are carved in the Ionic order. If numbers are impressive, The Arlington Memorial can be cited, being composed of approximately 100 columns of marble between 20 and 30 feet in length. Edward P. Casey, in designing the D. A. R. Building, in Washington, D.C., used groups of three marble pillars to support the corners of the portico. Other prominent structures designed in this style of exterior architecture in marble are: The Curtis Publishing Company's Building, Philadelphia, Pennsylvania; The County Court House, at New Haven, Connecticut; the Red Cross Building, at Washington, D.C.; and the Knickerbocker Trust Company, of New York City.

The New York Central Station at Utica, New York, is a building that any community would point to with pardonable civic pride. A person entering the waiting-room after a trip on a stuffy, dusty train is sure to feel freshened by the cool marble interior. The large pillars supporting the arched roof are notable examples of the use of Royal Antique marble in interior decoration. Their placid solidity is in restful contrast to the swift, noisy motion of the flying cars.

One of the largest and most magnificent columns ever quarried in America rests in the Art Museum at Montreal, Canada. It is a stupendous marble shaft 32½ feet long and 4½ feet in diameter. It came from Vermont. The block from which it was cut contained nearly 600 cubic feet of marble.

New York Central Station, Utica, New York. Stern and Felheimer, Architects.

---and in corridors of Office Buildings

CLEAN looking? Naturally, because marble is stainless and remarkably easy to keep free from dust and dirt. Besides these economical advantages, a marble corridor appeals to the tenants' sense of beauty and dignity---and that means a higher rental return for the owner.

THE PACKARD BUILDING

A Quaker City Structure that Contains a Banking Room Modelled After a Roman Basilica

IN Philadelphia, as in New York and Chicago, the erection of a new building, even though it be one of some size, is apt to pass almost unnoticed by the press at large; it is only one more of a considerable number of such structures, and as such its advent stirs scarcely a ripple on the surface of national interest. Moreover, Philadelphia seems peculiarly lacking in that enviable faculty, possessed by many lesser cities, of being constantly before the public eye for one reason or another; and with the exception of an occasional story concerning its police affairs, lives in almost complete seclusion.

The city is, nevertheless, fast acquiring a group of splendid office buildings that for architectural merit, constructional integrity and decorative beauty rank with the best of such structures anywhere in the world. One of the more recent of these is the new Packard Building at the southeast corner of Fifteenth and Chestnut Streets.

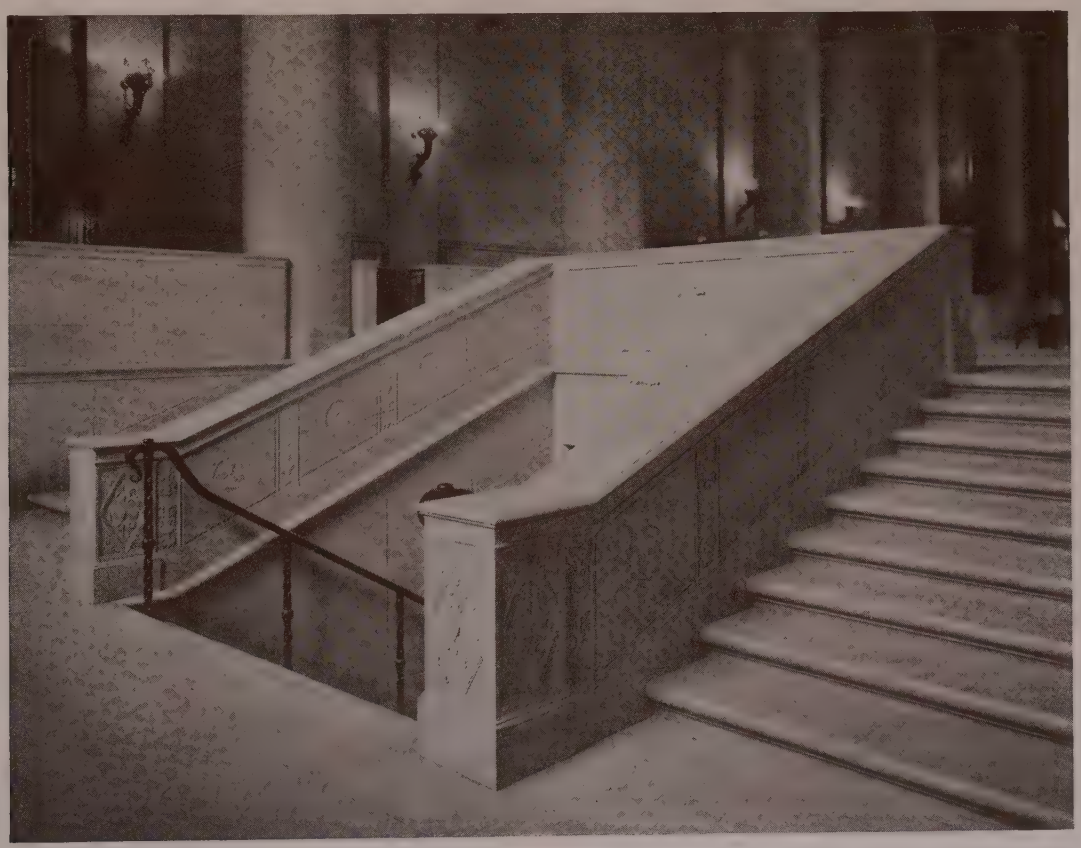
The site itself possesses no mean advantages, with Broad Street Station one square away, the Reading Terminal only

four blocks distant, and the banking and office building district encircling it on all sides. The building fronts 72 feet on Chestnut Street; laterally it extends 230 feet to Samson. It towers 24 floors above the sidewalk level, the lower portion of limestone and the upper stories of brick and terra cotta.

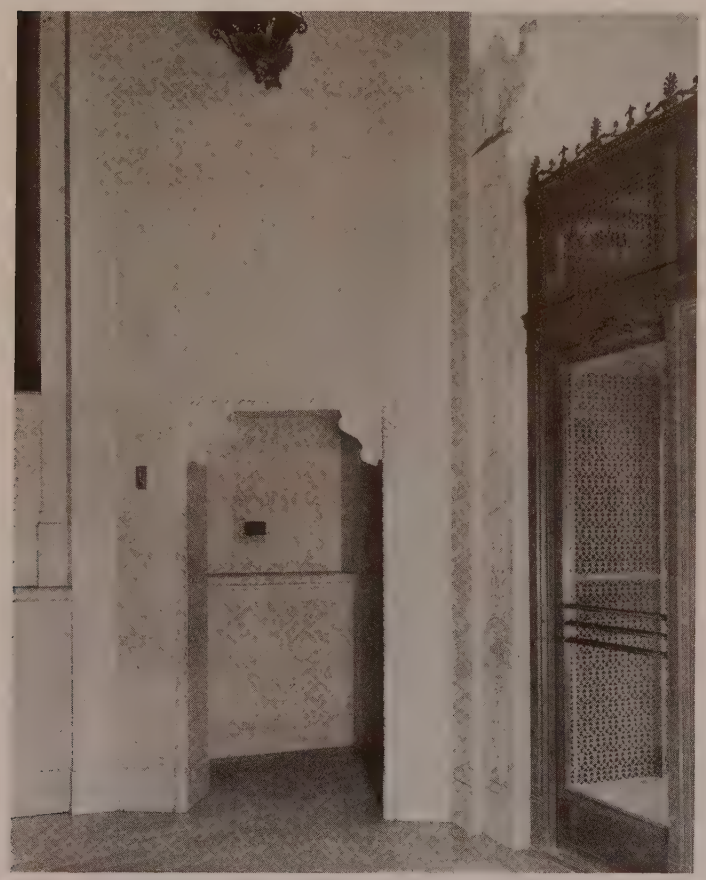
The architects, Ritter and Shay, of Philadelphia, have expressed a modern adaptation of the Italian Renaissance, and the exterior, especially of the upper portions, is both intelligently and originally handled. The interposition of a pair of Ionic columns on the Chestnut Street façade from the twentieth to the twenty-third floor levels, the setback of the top floor and the broad frieze at the very apex, are features of happy interest, and could be emulated to advantage by the brethren of the drafting board.

The Pennsylvania Company, an insurance organization, occupies the first four floors and the mezzanine and twenty-fourth floors, as well as the basement and sub-basement. The remainder of the structure is rented out as an office building, and each floor contains approximately 11,000 square feet of rentable area. The entrance to these offices is on Fifteenth Street, nearer to Samson than to Chestnut Street.

The dominating interior feature is easily the huge banking room on the first floor occupied by the Pennsylvania Company. Entrance to this room is from the Chestnut Street front, through a pair of wrought-iron gates by that master ironworker, Samuel Yellin. These are in an Italian design and are of monumental size.



Main Stair from entrance vestibule to the main banking floor above and to the Safe Deposit department in the basement.



Entrance from vestibule to elevator lobby. Notice the elaborate carving of the impost at the side of the bronze gate, and the eagle above.

Upon passing through the entranceway, a vestibule is reached from which easy access is had, either to the main banking room directly ahead by means of the ascending broad double stairway, or to the Safe Deposit department on the first floor below the street by means of the descending central single flight. Immediately to the right is a doorway, beyond which is an elevator that also leads directly to the Safe Deposit department, besides affording access to the Trust department on the second floor, the bookkeeping department on the third, and the Real Estate Title Insurance and Trust Company on the fourth. The trunk vault on the second floor below the street is also reached by this elevator. The main banking room level was slightly raised above the street level for a twofold reason: the floor level of the Safe Deposit department could thereby be placed at a less depth below the street; and there could be secured for this department an imposing ceiling height —both considerations of extreme importance.

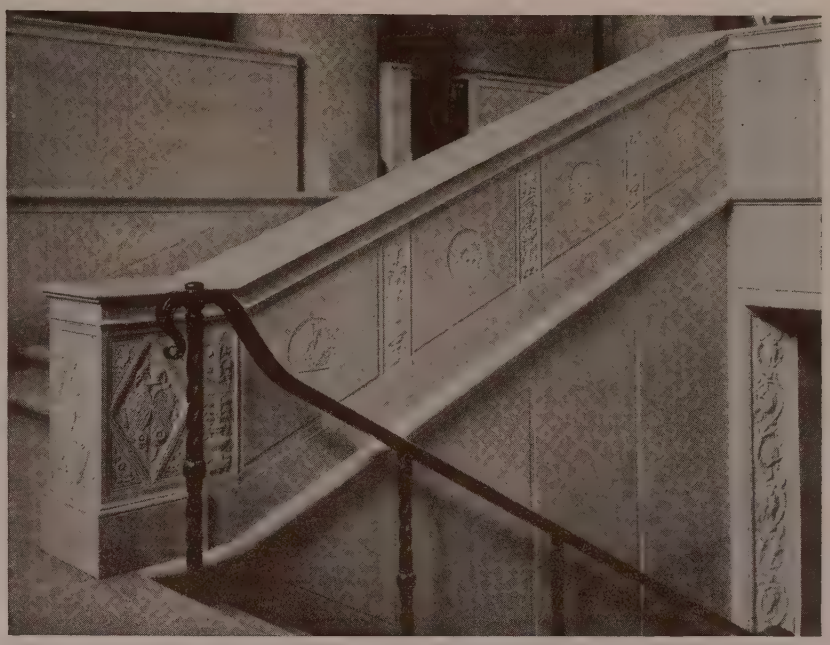
From any point in this vestibule, there is presented a profusion of gleaming marble surface interrupted at intervals by rich carving and delicate moulding. To either side of the bronze entrance gate is an elaborately sculptured newel post surmounted by an eagle, all of Botticino marble. This same material was used for the walls and doorways of both vestibule and main banking room, for the main stair except treads and risers and elsewhere in the building, as will be noted further on. The treads and risers of the main stair are of Napoleon Gray marble, as are also the floors of both vestibule and bank.

The main stair, as mentioned above, is double, and is a masterpiece of marble work. A carved eagle appears over the architrave of the middle or descending portion, flanked by discs that represent the two faces of the first legally authorized United States coin. An Italian scroll appears to either side of the entrance jamb, and this has as its central feature the pelican, symbolizing Protection. Interwoven in the scroll are symbols of Commerce, Industry, Trust and other phases of commercial activity.

The main banking room is a spacious chamber that is reminiscent of the Roman basilica. It has a total width of 65 feet, with a length of 115 feet over all. Two rows of massive columns, of the Ionic style, extend

the length of the compartment, dividing it into a large central space and two side aisles. The ceiling is in bas-relief, and is deeply coffered. At the rear of the room is an imposing stairway that ascends to the mezzanine balcony.

The warm neutral color of the Botticino marble of the columns and side walls is carried into the color scheme of the ceiling, which is decorated in low tones of old yellow, blue and green, and high-lighting of dull gold. The marble wall ashlar is 30 feet high; the floor is of Napoleon Gray marble.



Details of carved newel at vestibule level of main stair. All of this stairway is of Botticino marble, except the treads and risers, which are of Napoleon Gray.

Interesting additions to the main banking room are the main chandeliers, which are of massive size of wrought-iron design with dull gold high-lighting. These chandeliers are of the Italian lantern design and are about 7 inches high. The fixture immediately over the mezzanine is a circle of wrought-iron with the signs of the zodiac worked in bronze.

Marble doorway to the President's Room.

From the main banking floor one sees a beautiful vista through the vaulted corridor leading from the mezzanine balcony to the mezzanine banking space at the Sansom Street end. This vaulted space is treated with an Italian coffered ceiling decorated in dull blue, ivory and gold, which gives an interesting transition in the color scheme from the golden tones of the main bank ceiling to the more brilliant Venetian coloring of the mezzanine room beyond.

The counters are placed so that they run from column to column the length of the room and they are of the same material as the walls—Botticino marble—with screens of wrought iron of simple Italian design. This is a pleasing deviation from the usual

General view of Main Banking Room, looking toward the grand stairway from the Chestnut Street entrance.

Another view of the Main Banking Room. The columns, counters and walls are Botticino marble.
The floors are of Napoleon Gray marble.

heavy statuary bronze generally used in banking interiors. At regular intervals on the floor and against the counters are wrought-iron check-desks and benches, with Breche Violette marble tops that give a piquant touch of added color.

On the mezzanine floor is the President's conference room, finished in teakwood with panelled dado. The ceiling is supported by heavy Italian beams and carved supporting brackets, all decorated in Italian colors reminiscent of the Davanzatti Palace; these colors are in pleasing contrast to the dull gold color of the walls. The small conference room adjacent to the President's conference room is also treated in this same style.

Perhaps one of the most interesting features of the Pennsylvania Company's space in the Packard Building is the interesting group of marble carving on the stair ramps of the grand stairway, on the mezzanine balcony and on the pilasters at either end of the bronze vestibule. These carvings are replicas of coins and tokens in circulation in Colonial days and during the early days of the Republic, and some are of private issue or are memorial in purpose. The rosette design is not a coin, but a conventional design which alternates with the coins.

If an observer were to take a position on the intermediate landing of the stairs to the mezzanine, at the rear of the banking room, he would have, within his panoramic view, the complete series of fifteen designs which are used in the banking room and Trust department on the second floor. A numismatic manual would explain in more detail the variations in issues, their dates, etc., if one were inclined to be enthusiastic in the study

Grand stairway of marble leading from the main floor to the mezzanine floor and the Sansom Street end of the building.

Public space of the Trust Department, on the second floor. The marble is Botticino for walls, counters and pillars and Napoleon Gray for the floors.

of coins. A general explanation here will suffice.

Taking such a position as suggested, and starting with the coin at the bottom of the ramp on the Fifteenth Street side, the observer could follow the arrangement of coins in the following order:

No. 1. The "Rosa Americana," dated 1733. The crown and rose are both insignia of royalty.

No. 2. The next coin would show a shield surrounded by fifteen stars. The reverse of this coin (not shown) has the American eagle and thirteen stars.

No. 3. The "Fugio Cent," 1787, the first legally authorized United States coin. Here he would notice the thirteen original states each represented by a star within a link of an unbroken chain that surrounds a thirteen-pointed star with the caption "UNITED STATES WE ARE ONE." The opposite side of this coin would be directly behind the observer, showing a sunburst and the sundial with a thrift motto below, "MIND YOUR BUSINESS," which in those days had a somewhat different meaning than now.

No. 4. The "Washington Token," 1793. Continuing along the horizontal parapet of the mezzanine he would see:

No. 5. The "Brasher Doubloon," 1787, New York, a private issue, and incidentally one of the rarest and most valuable American pieces.

No. 6. New Jersey, 1788, with the horse and plow emblems.

No. 7. New Jersey, 1785, "Immune Columbia," with the Liberty cap on a standard, and holding the scales of justice.

No. 8. Maryland, 1783, with a likeness of Lord Baltimore. Turning around toward the

Details of the Grand Stairway.

east side of the stairs and starting at the bottom, the observer would see:

No. 9. Sommers Islands, 1620, sixpence, showing a frigate. This island, now Bermuda, was named after Captain Somers, the Englishman who colonized it and issued the coinage.

No. 10. Massachusetts "Pine-tree Shilling," 1652.

No. 11. The "Fugio Cent," 1787, commented upon under No. 3.

No. 12. The Brasher Doubloon, repeated.

No. 13. The Virginia Shilling, 1774, with the royal crown and shield.

No. 14. A "Threepence" piece of Connecticut, 1737-39.

No. 15. The "Elephant Token" of the Carolina Company, date 1694, issued as a memorial piece upon the granting of a charter to this trading company. The reverse of this piece bore a prayer, "God Preserve Carolina and the Lord's Proprietors," 1694. A similar piece was issued at the same time by the New England Company.

No. 16. Sixpence, Sommers Islands, 1620. This side of the coin shows a wild boar, and the reverse side a sailing ship. (See also No. 9.)

Another interesting group is that of aboriginal currency, executed in the wrought-iron work of the check-desks and the main entrance gates. These coins of the American Indian, chiefly of the Central and South American divisions, were made of quartz, lignite and other stones and minerals.

In the Safe Deposit department the floors are of Gray Napoleon marble with side walls and columns of limestone. The caps of the columns and pilasters are carved in an interesting design of the early Italian Renaissance and the corbels supporting the segmental arches are carved in the figure of a little miser holding a bag of gold.

The elevator lobbies and corridors above the ground floor are treated with marble terrazzo floors and a marble wainscot 7 feet in height. The toilet rooms throughout the building have a similar floor and wainscot and marble toilet stall. All the marble used for this work is White Alabama.

Italian scroll on the front stairway.

THE UNION STATION IN TORONTO

The New Building is Owned Jointly by the Canadian Pacific Railway and the Dominion of Canada

By JOHN M. LYLE, *Associate Architect*

IN the Middle Ages, the towns of Europe were fortified, and entrance gates from the main roadways were the portals to the towns. Today the modern railway stations are really the great entrance gates to our cities, so it is fitting that these stations should not only be practical in their layout, but should also command the attention of the traveller by reason of their architectural merit.

The designing of a great modern station demands a co-operation on the part of the architects and engineers. The Toronto Union Station is the result of much painstaking study on the part of a group of men, and is not in any sense the offspring of one individual mind.

When the two railways—the Canadian Pacific and the Grand Trunk—decided to build a new union station to serve the needs of the city of Toronto, they formed a company known as "The Toronto Terminals Railway Company," which was to have charge of the erection of the building, its maintenance and the operation of the station. Both railways were equally represented on the Board of the new company.

Since the inception of this company, the Dominion Government has taken over both the Grand Trunk Railway and the Canadian

The Main Ticket Lobby.

Northern Railway, and are now operating these systems under the name of "The Canadian National Railways," so that the Canadian Pacific Railway and the Dominion of Canada are really the joint owners of the new building.

Realizing the importance of Toronto as a growing center of traffic, it was felt that serious consideration should be given to the question of expansion, and that before beginning work on the plans, both the architects and engineers should visit the important American stations and prepare a report and preliminary drawings for discussion. Pursuing this policy the architects, Ross and Macdonald and Hugh G. Jones of Montreal, with John M. Lyle of Toronto as associate, were instructed to collaborate with John H. Fairbairn, chief engineer of the Canadian Pacific Railway; Mr. Safford, chief engineer of the Grand Trunk Railway; and Mr. J. R. Ambrose, engineer for the Terminals Railway Company. Following these instructions we visited twelve of the leading stations of America.

On these inspection trips different members of the party made individual notes which were in due course forwarded to a

central bureau where they were co-ordinated and tabulated for the purposes of the report. The collaboration of the architects and the engineers in this preliminary work was a most happy one and resulted in much friendly and profitable discussion. The report presented contains eighty-five pages of printed matter, together with the preliminary drawings. It is divided into eleven headings and is a most complete record of important railway data. After the preliminary studies were completed, it was evident that one of the outstanding needs in the development of the plan was the provision for expansion and the desirability of making the plan elastic, especially from the viewpoint of passenger traffic movement in and out of the station.

The final plan adopted lends itself to control of traffic movement. The station is so planned that under light traffic conditions it can be operated on practically one level and under heavy traffic conditions; by the closing of gates, the traffic can be diverted and the incoming and outgoing passengers separated on different levels, thus allowing the handling of a huge volume of traffic. This most elastic arrangement is one of the outstanding new features in the development of railway station planning.

The building is divided into three sections: a central block, given over to the station

View from passageway to train concourse.

In the lunch counter, gray Mississquoi marble was used for walls, counters and floors, with borders and bases of black Mississquoi.

proper; an east wing, given over to the Dominion Government Post Office; and a west wing, devoted on the upper floors to the railway offices of the Canadian National Railways, and on the ground and lower floors to the needs of the station.

The style of architecture adopted is Classic based on Roman and Grecian traditions, and the designers in the handling of the different architectural features have tried to exhibit that restraint in treatment which is so characteristic of the Grecian and Roman buildings. The principal architectural feature of the plan is the large central ticket lobby, from the center of which room—the information booth—all the numerous activities of the station are in plain view. The union ticket office extends along one side of the ticket lobby and on the opposite side are the baggage-checking and parcel-checking booths. The entrance to the train concourse, via a slight ramp, is in the center of this wall and the conveniences for the travelling public, such as telephones, telegraphs, newspaper stands, etc., are on this line of travel. Immediately to the side are the barber shop, smoking-rooms, lavatories, etc. On the west side of the ticket lobby is placed the main waiting-room, entirely aside from any line of travel movement. Off this room are placed the ladies' rest room, ladies' toilet, hospital accommodation, restaurant, lunch room, private dining-rooms, etc.

This ticket lobby is one of the large rooms of the world, measuring as it does 250 feet in length by 84 feet in width by 86 feet in height. The walls are built of Zumbo stone from Minnesota, a stone that is of a warm creamy color and has an interesting rough tapestry texture obtained by gang-saw finish with an admixture of fine shot in the sand when being sawn. The upper portion of the

room is of cast stone to match in color and texture the Zumbo below. The ceiling is of Gustavino Tile construction in three colors of a soft yellow to harmonize with the walls.

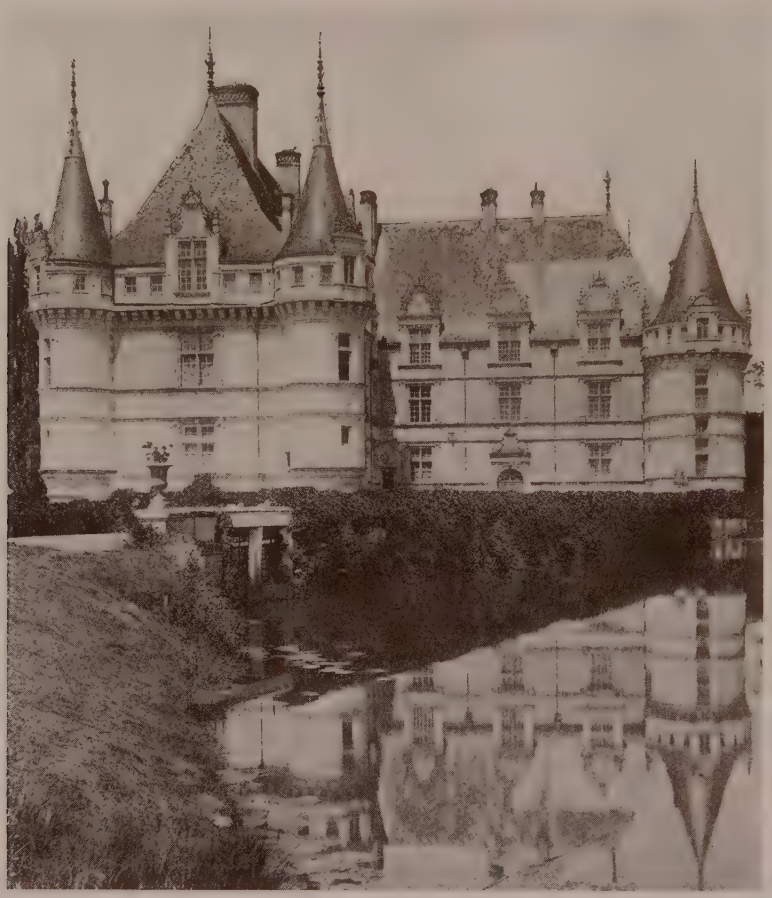
Having in mind the great desirability of permanency in construction, marble has been used extensively throughout the building, in floors, walls and lavatory partitions. The floors of the main ticket lobby are of Pink Tennessee with herringbone field and dark Tennessee formed in panels. The ticket lobby booths are of Pink Tennessee, as are the ticket and parcel-checking booths. The staircase to the lower level from this room is also Pink Tennessee. The walls of the barber shop and men's toilets are Mississquoi Regina and the walls of the ladies' toilets are Pink Tennessee. In the lunch counter curly gray Mississquoi — a light grayish-green marble—has been used most effectively on the walls. The same marble is used in the floors, and a border and base of black Mississquoi makes a most effective finish for this type of room.

The vestibule walls of the office section, as also those of the cab stand, together with the floors, are of Pink Tennessee. The vestibule of the post office section is of Napoleon Gray, as are the lavatory partitions of this section.

The extensive use of marble in this building has called forth many comments from the lay public who have been impressed by the rich appearance and permanent character of the materials used.

First and last impressions are largely permanent ones, and it is the hope of the designers of this building that it will not only meet the exacting material demands of the travelling public and allow them freedom of movement, but that it will impress the beholder with its architectural beauty in order that he may carry away with him some good opinion of the city of Toronto.

The Barber Shop of the Toronto Union Station. Its marble walls and floor make it a model of cleanliness.



East Façade, of Azay le Rideau.

THE STYLE OF FRANCIS I

Classic Elements Began to Dominate the General Composition of French Architecture

Part II: Azay le Rideau, Chenonceaux and Châteaudun

OF the lesser châteaux of that phase of the French Renaissance under discussion, one of the most attractive is Azay le Rideau, built on an island in the River Indre. It was begun in 1516 by Gilles Berthelot, whose initial is entwined with that of his wife Philippe in the carving. The site was so located that the course of the river could be divided, and the water caused to flow entirely around the house. The building was an entirely new structure of considerable beauty, though mediæval characteristics appear.

"By the buildings of a country one can tell the characteristics of the people," says Simpson, and he comments on the charm of Azay le Rideau as follows: "Probably no single building in France could be instanced which illustrates so well the taste, habits, hopes, and fears of a courtier of Francis I time as this gracious château. The rooms, large enough for stateliness and yet not too

Illustrations courtesy Thomas Machen, architect, Baltimore, Md.

grand for comfort; the well-proportioned windows, not too numerous, and yet sufficient in size and number to admit plenty of air and sunshine; the terrace surrounding the house and separating it from the river-moat, and the staircase leading to it; all show that the troubled times were passing, that men were able to indulge in peaceful country pursuits, and could afford some time for ease and quiet. Chambord is a royal palace; Chenonceaux, apart from its river galleries, is small; Azay le Rideau may be taken as the typical French country home of the early sixteenth century, which can be compared and contrasted with contemporary Italian villas, German Schlösser, and with Elizabethan country houses of fifty or sixty years later. It differs from all.

One of the round corner towers of Azay le Rideau, built in 1516.

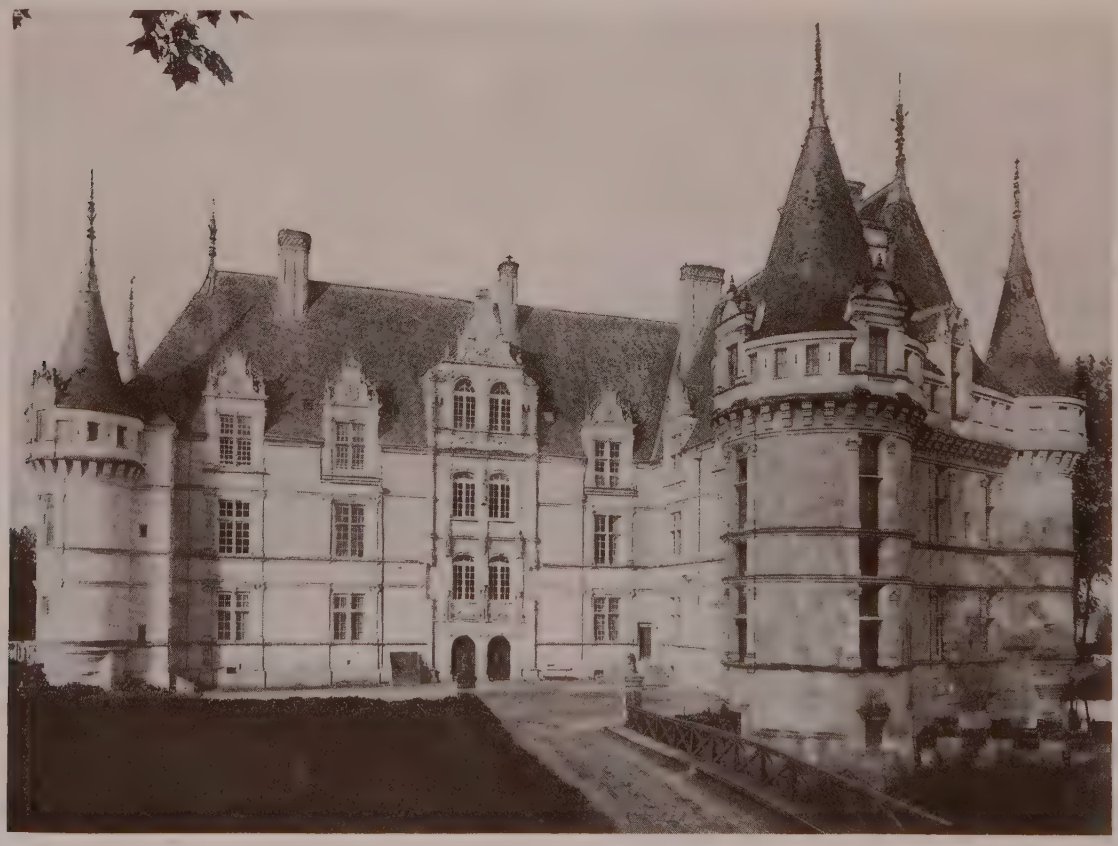
A bit of early Renaissance detail at Azay le Rideau.

In stateliness it may not equal the Villa; in homely comfort it may fall short of the English Hall. Notwithstanding its moat and machicolations, any one in danger would prefer the Schlöss. But for picturesqueness allied to a certain symmetry, for charm of position, although the country is flat, for beauty of detail and proportion and general sense of refinement, it would be difficult to find its superior in any country."

Azay le Rideau is not of large dimensions, but it serves most aptly to illustrate the mixed character of early French Renaissance. It is true that the ordinance is clear and simple and the ornamentation is confined, with unusual restraint and good judgment, to a few important features; these received their full value through the delicate elaboration of each. However, the L-shape plan shows round towers placed at the angles in imitation of feudal designs, though, as noted by Simpson above, there

was no longer any need for such defences. Furthermore, along the three outer sides are machicolations and a *chemin de ronde* forming a bold cornice, which extends around the towers so as to form a crown. This overhanging attic is so supported on corbels and pierced by numerous small windows regularly spaced, that the wall solids remaining between the fenestration take on the aspect of battlements. Tall dormers and chimneys, a sharply slanting roof with slender pinnacles at each end, and similar pinnacles capping each turret, complete a unique whole that is mediæval in its larger features.

It is in the pilasters that flank the windows and the entablatures that crown them that we see the effect of the new impulses. This is particularly true of the ornamental bay that contains the main portal. The scheme is palpably a reproduction of the Flamboyant Gothic staircase tower and entranceway of the nearby Châteaudun, which we will mention again. The details, of course, are changed, but the general design remains. There is a strange medley of columns, pilasters and ornaments of classic types arranged, however, so as to produce a Gothic effect. Charles H. Moore describes this as follows: "The portals and windows are flanked with pilasters and crowned with entablatures, and the whole is bounded right and left by superimposed columns broken by highly ornamented niches, and banded by the string courses and entablatures. On the first floor over the portal the window pilasters are made to appear as hidden behind tall ornamental niches, composed of many neo-classic and nondescript elements,

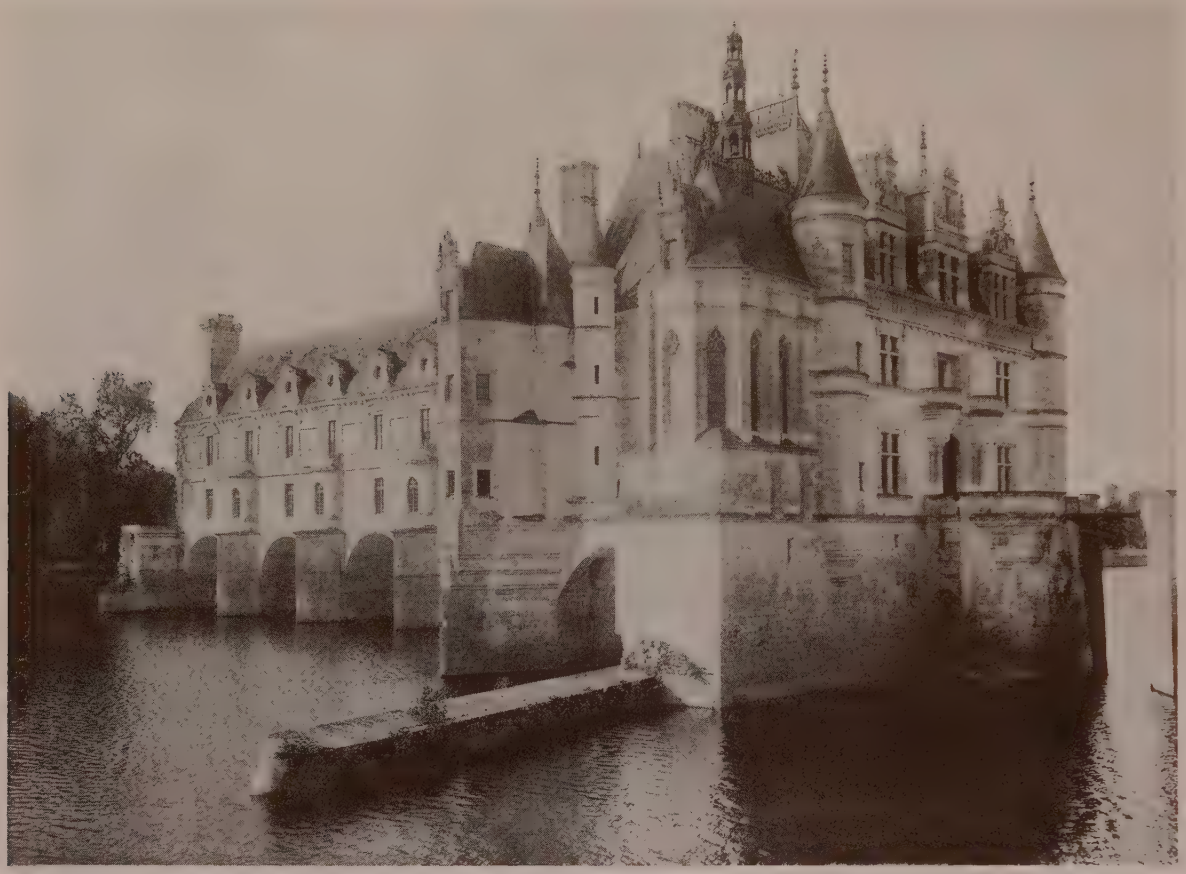


Principal façade of the Château Azay le Rideau. The influence of the new style is seen in the window treatment.

The southwest façade of Azay le Rideau.

arranged in the manner of the details on Flamboyant buttresses. Only small portions of the base mouldings of the pilasters appear beneath this filigree overlay. In the story next above the central pilaster only is hidden in this way, but here a part of the capital, instead of the base, comes into view. The manner in which the pseudo-Gothic features are adjusted to the neo-classic elements of the composition is curious in other ways. The pilasters of the several superimposed orders are, of course, of equal length in each story, and their entablatures make strongly marked horizontal lines. But the nondescript ornaments laid over these orders are carried up to unequal heights, all of them crossing the middle entablature, and the finial of the central one reaching above the architrave of the top entablature, while the lateral pilasters of this upper order are wholly exposed to view, except that the finials of the canopies over the niches below cover parts of their bases.

"The mixture of neo-classic and pseudo-Gothic forms is carried out in the details of these superimposed ornaments. Under the base of each niche are two diminutive pilasters, set obliquely so as to present an arris in front, like the angular members in Flamboyant buttresses, as in Châteaudun, and between these is a small shaft supporting a corbel which forms the base of the niche. The niche is flanked by slender pilasters set obliquely in conformity with those below, but these pilasters are almost entirely hidden from view by very salient nondescript ornaments worked on the face of each. The mouldings of the grouped bases, which are of different magnitudes, interpenetrate in Flamboyant fashion, and the canopies over the niches are made up of miniature entablatures on curved plans ornamented with



The eastern façade of the Château de Chenonceaux, on the Cher River. Built by Thomas Bohier in 1515.

filigree, and each of them is surmounted by a group of minute niches with statuettes, and crowned by a filial. The windows have the depressed arches of the Flamboyant style, with panelled dadoes beneath, as in Châteaudun; but their profilings are pseudo-classic, and they have keystones at their crowns. The total scheme is more mediæval than classic, notwithstanding the free use of neo-classic orders. To produce a continuity of upright lines, and thus emphasize the Gothic effect, the entablatures are broken into ressauts over the pilasters, and are carried around the lateral columns, as before remarked. The double portal is the only part of the composition that is quite free from mediæval elements. The order and the arches are here combined in the ancient Roman manner, as they are, indeed, in the upper stories; but here the arches have the Roman semi-circular form, and the order is not overlaid with other ornaments. Classic proportions are not all observed. The pilasters are short, and are raised on high pedestals, which are necessary to the composition in order to give the effect of adequate foundation for the superstructure. The design as a whole has no reason on structural grounds, nor has it any logic of simulated structure. Such merit as it has is of a purely abstract ornamental kind entirely extraneous to the building. Apart, however, from its factitious general character, and its incongruous details, the château of Azay le Rideau has a thoroughly French character, and is one of the finest

monuments of the early Renaissance in the country."

The main portion of the château of Chenonceaux was begun in 1515 by Thomas Bohier on the Cher River near the north bank. The water flows under and, at times, around it. The original building was a rectangular block replacing an old mill, built on stone piers and arches and connected to the right bank by a bridge. The property came later into the possession of Henry II, who gave it to Diane de Poitiers, who built a bridge across to the opposite or south side. Catherine de Medici, the widow of the king, compelled Diane to exchange it for Chaumont, and in 1560 added the upper galleries to the bridge. The entrance front is low and without beauty, though of interest as an example of the various ways Flamboyant ideas persisted in manifesting themselves. The corbelling carrying the balcony is clumsy, being composed of graduated wings of masonry, supported on a heavy pilaster and two small shafts; the arch is three-centered, with a keystone and what Willis calls a "continuous impost." The jambs show simple mouldings, and the arch is flat—both of these indicative of the Flamboyant deeling that makes itself apparent throughout the whole scheme.

Early Renaissance detail on the wall of the vestibule of Chenonceaux. The carving is in an excellent state of repair.

A picturesque view of the north end of Chenonceaux.

The circular towers at the corners of this square-shaped structure are small and hardly more than turrets; they do not start from the ground, but, as at Azay le Rideau, from corbels several feet above it. The eastern side has its façade broken by two projections, one of which is the chapel. The dormers are bold and pleasing, and stand in fine relief against the broad expanse of the

high, sharply pitched roof. The tower of the Marques at the head of the bridge has an exquisitely decorated doorway; adjacent is the old *pont levis*, its ancient beams in an excellent state of repair; these two are highly picturesque additions to a composition that in itself merits considerable attention.

The Châteaudun was built in the beginning of the sixteenth century, and stands not far from the castle of Azay le Rideau. It is a somewhat forbidding pile of heavy lines, distinguished chiefly by a staircase tower four stories in height, that dominates the south façade. At the base of this tower is the main portal of the castle. The walls of the façade is flush with the tower wall, but the latter is enriched with ornamentation, and the two upper stories reach above the main cornice. Flanking these are round turrets that overhang the wall, which is corbelled out to support them. The entranceway has double openings, which have their counterpart in each story of the bay above. The arches of these openings show the flat arch characteristic of Flamboyant design; the same influence is seen in the sharp arises of the profilings, and in the middle pier that rises through the center from top to bottom of the whole composition. This middle pier has a small buttress, and other buttresses flank the whole bay, with their angular members placed obliquely. Niches and canopies are placed in the usual manner on the design and the openings themselves are splayed. As remarked above, this arrangement probably furnished the motif for the portal of Azay le Rideau.

The west façade of Châteaudun, as seen from the Loir.

A DEPARTMENT STORE OF FINANCE

Three of Chicago's Time-Honored Banking Institutions Unite to Form Organization.

IN the last two decades of the nineteenth century, the United States saw the development of the department store idea; the advent of such huge concerns as Wanamaker's in Philadelphia, Marshall Field's in Chicago and Filene's in Boston stimulated the imagination and gave to retail merchandising an entirely fresh outlook. The dry goods merchant princes of the period became themselves the leading financiers, and such giants of finance as George Peabody, J. S. Morgan, the father of J. Pierpont, Sr., Marshall Field and many others derived their early wealth from their successful merchandising methods.

Bankers were quick to see the advantages of the department store system applied to their own businesses and in the early part of the present century we find banks adding department after department and service after service. The logical development was seen in the mergers of separate banks. These mergers brought together under one directorate such resources as, previously and individually, were not quite sufficient to meet the local needs; but, collectively, were more

The Commercial Banking Room on the main floor.

than ample for even the demands of the the most rapidly growing communities.

Such a merger was recently accomplished in Chicago when three of Chicago's oldest and largest financial institutions consolidated to form the Illinois Merchants Trust Company. These three banks—the Illinois Trust and Savings, the Merchants Loan and Trust and the Corn Exchange National—represent combined resources of nearly $500,000,000, a sum staggering to the imagination. The total deposits reach almost the same stupendous figures, and the number of employees runs close on to 1,700.

Before the merger, each bank had been housed in a separate structure, situated several blocks apart; now they are together in what one writer recently declared was "Chicago's most impressive building," occupying an entire city block bounded by La Salle, Jackson, Clark and Quincy Streets. It is the largest office building in Chicago and the third largest in the world, being surpassed in size only by the Equitable Trust of New York and the Union Trust of Cleveland. The site is 325 feet long by 174 feet wide, and there are twenty floors above the street level, reaching a height of 285 feet. Some 22½ acres of floor space are represented by these figures.

The architects, Graham, Anderson, Probst and White, of Chicago, followed the traditions established with the building of the United States Treasury Department at Washington. This is seen in the unbroken colonnade of Ionic character stretching from La Salle to Clark Streets on the Jackson Street front, and in the façade of the main entrance on La Salle Street. The crowning exterior feature of the big structure—and, incidentally, a feature entirely new to Chicago—is the treatment of the main cornice, which is built of heavy cast burnished copper, and decorated with gold and color. The three top stories just below have pilasters in low relief.

The outstanding interior feature is easily the main banking room, a splendid hall of Classic design that rises to a height of 53 feet, or the equivalent of four stories of ordinary height. It is open on all four sides to the light, and is surmounted by a skylight of special opaque glass. Twenty-eight fluted Ionic columns, each 38 feet high, of Cunard Pink marble, serve to divide the open lobby from the great cages; the walls from floor to ceiling are also of Cunard Pink. This marble comes from a quarry in Italy near Chiampo; it has a reddish-pink ground intersected by veins of light yellowish-pink and dark shades.

The floor of this magnificent room covers approximately one acre of floor space and is of a French marble—Hauteville. In the central space is an enclosure of Tavernelle Rose marble, imported from Italy. This latter material is also used for the tellers' cages, check desks and for the banking screen along each side of the long chamber. Marble counter space of a total length of 1,512 feet is provided for the public. At the base of many of the columns, and elsewhere around the room, are torchiers, seventeen in all. These were hand carved in Italy, with graceful bowls at the top made of white alabaster.

The ceiling of the aisles is heavily coffered with alternating octagons and squares; the border of the ceiling over the central portion is also deeply coffered. Between this border and the top of the pink pillars runs a deep frieze decorated with mural paintings by Jules Guerin, each representing the characteristic industry or achievement of the nations of the world. The background between the paintings is composed of pictures of the buildings of the World's Columbian Exposition, done in a lower key to give

The broad stairway of marble that descends from the main banking room to the La Salle Street lobby. A marble balustrade surrounds the opening at the head of the flight.

the figure their suitable prominence. The entire ceiling, including the supporting members of the vast skylight, is executed in polychrome, harmonizing with the murals, blending with the marble walls, columns, counters and floors, and giving the entire room a warmth of delicate color both unusually pleasing and beautiful.

Near one end of the central space is a marble balustrade that marks a stairway opening. This stairway, built entirely of marble, is of gentle incline and generous width, with three landings along the course of its flight. It descends into a lobby that opens upon La Salle Street. Floors, walls and counters, as in the main banking room, are gleaming marble. In the basement are the most extensive safe deposit vaults in the West, with a capacity of 45,000 boxes.

The center of the huge building is pierced

down to the fourth story by a white enameled brick court, assuring all offices of window openings to the daylight. The corridors are of white Carrara wainscoting with a base of green marble from the Alps. It is claimed that 300 carloads of marble for three miles of flooring and four miles of wainscoting were required for this corridor work. Since the lobbies are unusually broad and spacious, and twenty-four passenger elevators operate daily, the new structure is unquestionably the first in Chicago in luxury and comfort, and this is reflected in the rentals received, as well as in the high type of tenants occupying the structure.

Entrance to the Safety Deposit Department from La Salle Street lobby,
Illinois Merchants Trust Company, Chicago.

A LIST OF THE WORLD'S MARBLES

By J. J. McCLYMONT

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

GROUP A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

GROUP B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

GROUP C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

GROUP D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

Onyx (Continued)

Both are composed of pure carbonate of lime. The Onyx, however, contains some iron oxides and other coloring matter that Travertine does not possess.

For Onyx see: Algerian Onyx, Arizona Onyx, Brazilian Onyx, Breche African Onyx, California Onyx, Chilian Onyx, Cicilian Onyx, Colorado Onyx, Egyptian Onyx, Gibraltar Stone, Italian Onyx, Maragha Onyx, Mexican Onyx, Missouri Onyx, Moroccan Onyx, Pedrara Onyx, Rouge Agate, Stalagmite di Bedat or French Onyx, Tyrolese Onyx, Utah Onyx.

In addition to the above, Onyx is quarried at Alicant and Valencia, Spain, at Trapani, Sicily, and at various other places.

Onyx Alabaster

Generally this name, or Oriental Alabaster, is only applied to Egyptian Onyx, but in many cases it has been used as the name for Algerian Onyx and sometimes for Italian Onyx.

Onyx Algerian—See Algerian Onyx.

Onyx Dore Contre Passe

Ain Smara Quarries, Constantine, Algeria, Africa.

Mottled light amber with a few white but not prominent veins.

Onyx D'Ore or *Onyx D'Ore Passe* or *Golden Onyx*

Ain Smara Quarries, Constantine, Algeria, Africa.

Mottled light amber with white wavy bands.

Onyx du Marco

French name for Algerian Onyx.

Onyx Nuagl

Ain Smara Quarries near Constantine, Algeria, Africa.

Mottled light amber with a few white clouds.

Onyx Nuagl Contre Passe

Ain Smara Quarries near Constantine, Algeria, Africa.
Mottled light amber with light wavy veins of white and occasional traces of light pink.

Onyx Red Agate

Same as Rouge Agate.

Opal or *Opale*

As used in describing marbles signifies creamish-white with variegations.

Opalescent Lumachelle

Same as Bleiberg.

Opal Jaspe—See Breche Benou Jaspe.

Ophicalcite or *Ophiolite* or *Ophite*

The name "Ophicalcite" is applied to the spotted green and white varieties of serpentines, by various writers and architects, regardless of whether the rock is a true serpentine or is Ophicalcite, which is composed of both serpentine and limestone. Many of the Verds, or Verd Antiques, and so-called serpentines are Ophicalcites.

Ophicalcite de Pietra Lavezzra

Same as Genova Green.

Ophicalcite di Levante

Same as Verde de Levante.

Ophiolite or *Ophite*—See Ophicalcite.

Opus Albarium

Vitruvius gives this name to a stucco composed of ground marble.

Opus Alexandrium

Ancient pavement used in churches, etc., in imitation of the Ancient Sectile. In Gothic times large quantities of Egyptian Red Porphyry was used for this purpose.

Or—Gold.

Oran Marbles—See Numidian marbles from the Kleber Quarries.

Oran Onyx

Same as Algerian Onyx.

Oran Serpentine

Kleber Quarries, Oran Province, Algeria.
Green is the dominating color, but it is profusely mottled with black. (Watson.)

Orange—See Borenore Blue, Caleula Dark, Caleula Light, Windellama.

Orange du Nivernais

Quarried at Taveau, Nievre, France.
Orange tinted. (Blagrove.)

Orbost

Quarries near Orbost, Gippsland, Victoria, Australia.
Gray and pink mottled and has a brecciated appearance. (Watson.)

Orenburg—See Gray Ural, White Ural.

Oriental Alabaster
Ancient name for Egyptian Onyx.

Oriental Marble—Group D
Quarried at Swanton, Vermont.
Deep red and brown with small spots of white.

Oriental Oleoso
Same as Alabastro Oriental Oleoso.

Orival
From the Orival Quarries, in the Lower Siene, France.
Brown with black veins. (Blagrove.)

Orival Stone—See Caen Stone.

Oro—Gold.

Oroomiah Lake—See Tabriz.

Orsera—Group C
Quarried on the west coast of the Istrian Peninsula, at Orsera, a small town a little south of Parenso.
Light fawn colored stone with faint light mottlings or small patches. (Watson.)

Osseux
Quarried near Verona, Italy.
Reddish-green with large white fossils. (Blagrove.)

Ossifero Chiaro
Same as Bigio Antico Ossifero Chiaro.

Ostergotland Province—See Ringborg Green.

Oszlopp Limestone
Quarried near Oszlopp, Lower Austria.
Chalky white, buff and gray. Will not polish.

Otago—See Caswell Sound.

Oued-el-Aneb
One of the non-producing quarries of the Deposit of Constantine.

Ovalle—See Lapis Lazuli (Chili).

Oye
Quarried at Oye, near the Lake of St. Pont, Doubs, France.
Light pink spotted with bright red. Takes high polish. (Blagrove.)

Ozark Gray—See Carthage, Ozark Gray Veine and Veinless, also Oklahoma.

Ozark Marble—See Oklahoma.

Ozark Pink—See Oklahoma.

Ozora Marble Quarries—See St. Genevieve.

Ozora Marble—See St. Genevieve.

Pacagne
Quarried at Gandrieux, Nord, France.
Clear light gray.

Paglino
Same as Giallo Antico Paglino.

Paitone—See Aurora Rossa and Breccia Aurora.

Palatia Quarries—See Marmara or Marmora.

Pale Siena

Same as Siena Light Galena.

Pallas Kenry

Quarried at Limerick, Limerick County, Ireland.
Red.

Palliato di Casentino (Breccia)

Quarried near Casentino, Tuscany, Italy.
Varied shades of yellow. (Blagrove.)

Pallido

Same as Giallo Antico Pallido.

Pallizzi—See Agrillei, Calderano and Torrevarata.

Palmaria

An island in the Gulf of Spezia not far from Porto Venere, Liguria, Italy.
See Portor.

Palombara Alabastros

This name is taken from a villa outside the Porta Pia where this material was originally found.
The various varieties of Palombara listed below all contain more or less opaque white.
The above and list that follows is from Pullen's "Ancient Roman Marbles":

Palombara Bianco Listato Alabastro

Pure chalky-white, finely ribboned with yellowish-brown.

Palombara Brunastro Alabastro

Lichen of pinkish-brown, mapped and waved with light brown and bordered with dark lines.

Palombara Dendritico Alabastro

Parallels of opaque ivory or bluish-white, violet, and pinkish-brown.

Palombara Eburueo Albastro

White.

Palombara Fasciato Alabastro

Brown bands of ivory veined, with delicate streaks of pink and brown.

Palombara Listato Alabastro

Fine parallel lines of brownish-pink, lilac and green.

Palombara Listato Fiorito Alabastro

Light brown with islands of darker shade and chocolate coast line.

Palombara Pavonazzo Alabastro

Striated lilac, yellowish-brown and white.

Palombara Rigato Alabastro

Similar, with lines more decided and firm.

Palombara Rossastro Alabastro

Pinkish-brown lichen veined with opaque white.

Palombara Rosso Listato Alabastro

Straight parallel lines of chalky-white, light brown and green, part mottled with pink lichen.

Palombara Tartarugato Alabastro

Opaque white, with foliage of tortoise-shell.

Palombara Violetto Alabastro
Light chalky violet with veins and cross lines of earthy brown.

Palombino
Quarried at Carrara, Italy.
Dove colored with delicate white blotches. (Blagrove.)

Palombino
All ancient marbles of this name are found in small chips or squares and seldom in large blocks and are generally believed to be synactic marbles from Asia Minor.

Palombino Bianco (Ancient)
From the banks of the Coralio in Phrygia, Asia Minor.
Ivory-white of very fine grain, sometimes faintly spotted with gray.

Palombino Brunicco (Ancient)
White like polished earthenware powdered with chocolate.

Palombino Eburneo (Ancient)
Ivory color.

Palombino Latteo (Ancient)
Milky-white.

Palombino Giallognolo Lumacato (Ancient)
Yellowish-white with long fragments of shells. It has been claimed that this marble is from Megarius, Livadia.

Panche—See Gris Panache.

Panno di Morto
Same as Black and White Antique. An ancient marble, from an unknown quarry. Black with white fossils about an inch long. (Blagrove.)

Pan-Tha
Chinese name for Burmese White Jade.

Paonazzetto
Quarried in Italy.
White to cream background with sharp and distinct numerous fine veins.
Takes high polish.

Paonazzo
Quarried in Italy.
White to cream background with dark veins mostly black-violet.
Takes high polish.

Paonazzo (Algerian)
Same as Numidian Pavonazzo.

Paonazzo Clair Colocarra
Quarried from Colocarra Quarry, Tuscany, Italy.

Paonazzetto Crestola
Quarried at Carrara, Italy.
Golden cream background with black veins of varying widths.
Takes a high polish.

Paonazzo Italian—See Italian Pavonazzo.

Paonazzo Rosso
Same as Breccia Pavonazzo.

Para
Same as Bardiglio.

THROVGH THE AGES

VOL. 3 JANUARY, 1926 NO. 9

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View of one portion of the main banking room,
Union Trust Company of Pittsburgh

THROVGH THE AGES

A Monthly Magazine devoted to the uses of Marble - its universal adaptability, beauty, permanency and economy.

VOL. 3 JANUARY, 1926 NO. 9

TESTING MARBLE

The Bureau of Standards in Washington Has Partly Completed Its Series of Investigations

"THE evolution of man," wrote Dr. F. C. Brown, in the *American Review* over a year ago, "has taken place in a standardized world, with established laws describing gravitation, mass action, motion of matter, radiation, chemical action and, in fact, every elementary phenomenon of nature. Nature standardizes her phenomena. But the standardization of the articles of commerce made from the natural materials about us is in the hands of man."

It was with the keen realization of the importance to mankind of absolutely correct standards of weights, measures, qualities and performances that Congress established, in 1901, the National Bureau of Standards in Washington. Originally the Bureau was under the Treasury Department; in 1913, when the Department of Commerce and Labor was divided into two separate departments, the Bureau was taken over quite naturally by the Department of Commerce. The first director was Dr. S. W. Stratton, who came from the University of Chicago. Starting with a staff of less than a dozen scientists, he continued in charge until the end of 1922, when the institution could boast of a force of about a thousand employees, half of whom were trained college men. The present director is Dr. George K. Burgess, who had been with Dr. Stratton almost from the beginning.

Part of the Organic Act of the Bureau of Standards reads as follows: "That the functions of the Bureau shall consist in the construction, when necessary, of standards, their multiples and subdivisions . . . . and the solution of problems which arise in connection with standards; the determination of physical constants and the properties of materials, when such data are of great importance to scientific or manufacturing interests and are not to be obtained of sufficient accuracy elsewhere."

The National Association of Marble Dealers believed that there was a very real need for the determination of the properties of both interior marbles and the marble cleaning compounds that were offered by the trade; and the solution of the problems that arise in connection with the installation of interior marble and its upkeep. As a consequence of such belief, the Association made arrangements with the Bureau of Standards to undertake a series of investigations that should endeavor to shed light

Chemical table and experiments on the means of removing various kinds of stains.

upon the points involved. A brief account of the proposed work of the Bureau appeared in the June, 1925, issue of THROVGH THE AGES, and two of the apparatus devised by the Bureau were pictured. While the work is not by any means completed, and will not be for some time, sufficient progress has been made to date to justify certain conclusions. These conclusions, and the data upon which they are based, will be presented, as early as possible, in the pages of THROVGH THE AGES. The first of the articles, "The Resistance of Marble to Salt Solutions," will appear in the near future.

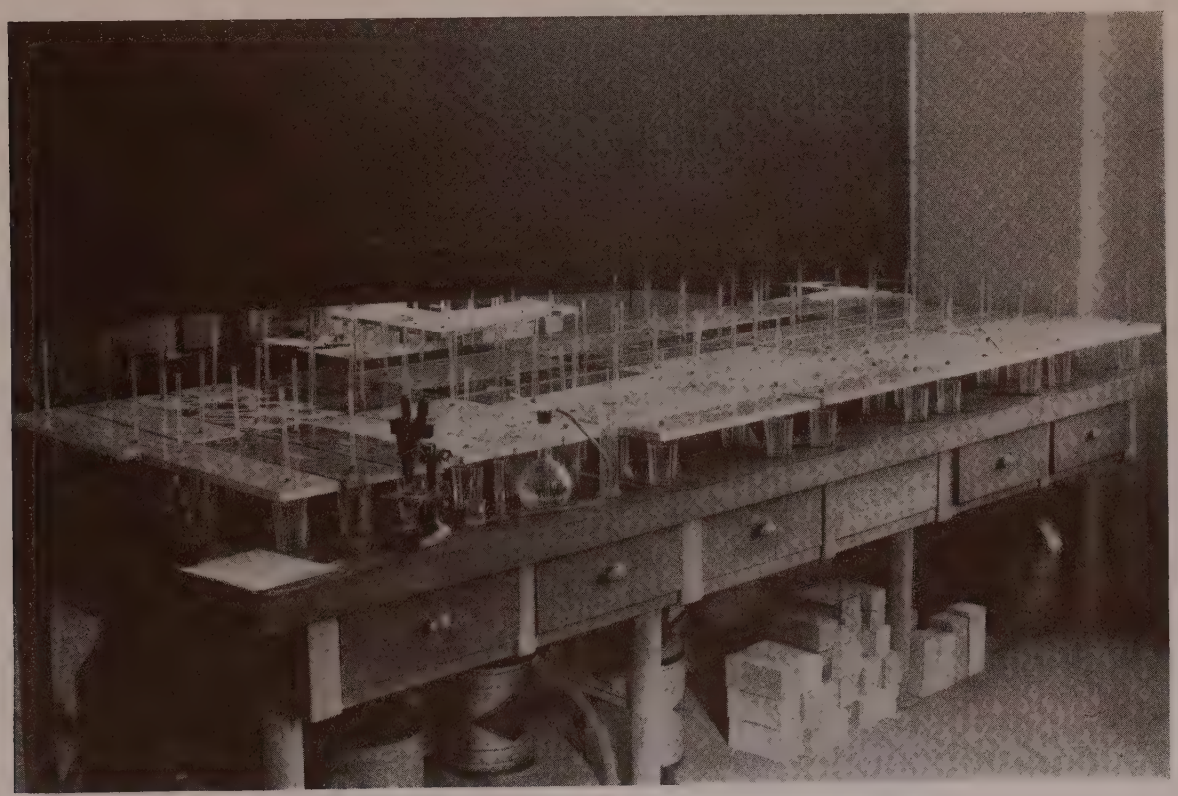
The work of the Bureau in this investigation is, even to a casual visitor, intensely interesting. A large room in the west wing of the Industrial Building is given over to the experimental work. At one side are long tables crowded with glass vessels filled with liquid, each container supporting a square slab of marble of a different variety. Nearby are tables whereon, in orderly array, are longer slabs of marble, each labeled and resting upon two glass vessels from which protrude, through holes in the marble, two glass tubes, like masts in the crude home-made boats of our boyhood days. To one side is what looks like an old-fashioned mill-wheel, that revolves so slowly it takes six hours to make one revolution. Its perimeter is composed of thirty-six slabs of marble; each of these is undergoing in turn a thorough scrubbing, automatically accomplished by a felt mop that dips into a cleaning solution. A machine for testing the transverse strength of marble; another that tests its permeability; a device for studying the effect of moisture seeping through backing materials—and many other pieces of ap-

paratus originated for the most part by the Bureau of Standards—are seen at various points around the room.

The scrubbing machine mentioned will throw considerable light upon the efficacy of the various marble cleaning compounds now offered for sale and recommended by some marble dealers; at the same time it will disclose the harmful effects, if any, that result from the use of such cleaners. At present, it appears that the cleaners that seem the most effective are those containing the largest proportion of abrasive, insoluble materials. On the other hand, these are the most harmful to the marbles themselves. The problem, therefore, is to determine upon the best combination of materials that will prove a good cleaning compound and yet will not injure the surface or change the texture of the marble itself.

The Bureau of Standards is using for the scrubbing tests slabs of representative marbles, both foreign and domestic. In the pan containing the liquid in which the felt mop dips is a solution of soda ash, volcanic ash and soap. These ingredients are typical of the bases of the commercial scrubbing compounds usually recommended for cleaning marbles with low polished surfaces, such as floors. The apparatus is so arranged that each of the thirty-six slabs is scrubbed for ten minutes at a time, the mop being so adjusted that there is a pressure of one pound to the square inch of contact. Each set of slabs is scrubbed for six weeks, the total amount of scrubbing being equal to that received in some fifty years of actual service.

There are about ten commercial preparations in general use for cleaning marble. Each of these is being tested on a representa-



Tests on various marbles for comparing the permeability properties and determining the actions of various salt solutions.

Tests to determine the effects of damp wall conditions and various backing materials on many different kinds of interior marbles.

tive group of marbles. The cleaning compounds at present offered by the trade are of two types: First, those containing some scouring material of an insoluble nature, such as volcanic ash or powdered silica; and, secondly, those that are entirely soluble and free from grit.

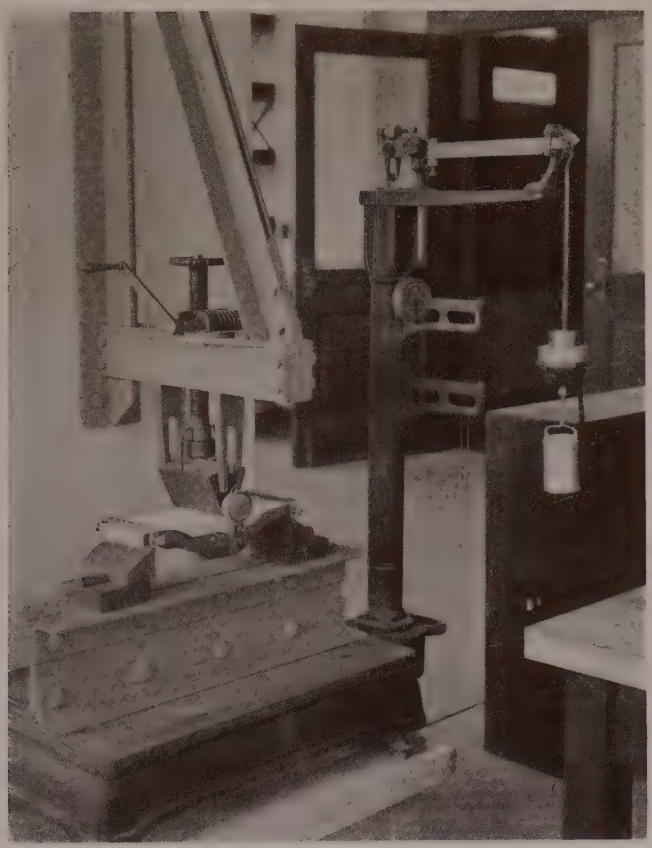
The microscope readily shows the presence of the insoluble crystals in the first type of compounds; these crystals look, when seen through a high-powered lens, for all the world like pieces of broken-up glass. It is readily understandable how such particles could exercise an abrasive action upon the surface of the marble, and result in considerable damage to the polish. It is also possible that there is a tendency of the soluble materials to disintegrate the marble. Again, it is possible that either type could produce discolorations, due to the prolongation of the test. These are some of the things that the Bureau proposes to find out, and, apparently, *is* finding out.

The question of the disintegration of marble due to the crystallizing action of various salts, such as are frequently encountered under service conditions, such as in the fronts of soda fountains, tops of counters in lunch rooms, and the like, is being investigated by the Bureau. Common table salt, sodium carbonate, sodium sulphate, ammonium carbonate, magnesium sulphate and tri-sodium phosphate (some of these being found in cleaning preparations), are some of the salts used in the tests; in addition, the effects of such substances as sugar, washing soda, yellow soap, castile soap, Gold Dust and Fairy Soaps are also being observed. The method of conducting these tests is to drill a hole in the center of a marble slab, and insert a glass tube through this. The slab rests upon the top of a glass tumbler con-

taining a solution of the substance under observation, the glass tube extending into the liquid and protruding some 6 or 8 inches above the surface of the marble. The top of the tumbler is sealed to the under side of the slab, and the opening in the marble through which the glass tube passes is also sealed by means of rubber gaskets. The entire arrangement is airtight; the solution in the tumbler is replenished by pouring it in through the open end of the tube, until a column of the liquid stands to within an inch or two of the top of this tube. By this method, the lower surface of the marble is constantly in contact with the liquid; in addition, the amount of absorption of the liquid by the marble is readily shown by the decrease in the height of the column within the tube.

That certain marbles do absorb liquids is quite readily apparent by the crystals that are forming on the top of the marble slabs. Furthermore, that such crystallization is deleterious to the marble is shown in some instances by the spalling that is apparent. Just how each of the marbles used in the laboratory will react in these tests is a matter of real interest to the industry.

It is not stating it too strong when we say that these and other tests may well save the American people millions of dollars in effecting the elimination of the use of the wrong kind of marble for specific purposes, or in leading to measures to protect the marble. The value to the nation of the wiser and more economical selection of material that may result from this work is beyond estimate.



Apparatus to determine the strength and elasticity of small marble slabs.

East Entrance to the Taft & Pennoyer Building, Oakland, California, showing shop windows and vestibule trimmed in Verde Antique from Vermont. Parkinson & Bergstrom, Architects.

MARBLE STOREFRONTS

IN those halcyon days of Rome's supremacy, shopping presented a picture which was strikingly similar to our American interpretation of that art of examining, without purchasing, the wares of the shops and stores. The Romans, it appears, developed a passion for collecting rare objects and, like modern bargain hunters, spent long hours in the market places searching for some perfect bit of workmanship exquisite enough to tickle their exacting fancy. Very frequently, too, they returned to their marble mansions with little or nothing to show for their prolonged efforts.

Mamurra, a noted connoisseur of fine marbles, seems to have been quite a collector, although his eagerness was tempered at times by another characteristic. It is told of him that, "after having walked long and anxiously in the squares where golden Rome ostentatiously displayed her riches, he uncovered the tables square and round; and

asked to see some rich ivory ornaments which were displayed on the upper shelves. Then, having four times measured a dinner couch for six, wrought with tortoise-shell, he sorrowfully regretted that it was not large enough for his citron table. He consulted his nose whether the bronzes had the true Corinthian aroma, and criticized the statues of Polyclitus! Next, complaining that some crystal vases had been spoiled by an admixture of glass, he marked and set aside ten Myrrhine cups. He weighed ancient bowls, and inquired for goblets that had been ennobled by the hand of Mentor. He counted emeralds set in chased gold and examined the largest pearl ear pendants. He sought on every counter for seal sardonyxes and cheapened some large jaspers. At last, when forced by fatigue to retire at the eleventh hour, he bought two cups for one small coin, and carried them home himself."

Perhaps the experiences of this old Roman compare favorably with similar actions of twentieth-century shoppers, yet those business places, where he entertained himself, present a striking contrast to the commercial structures which tower above the modern street. It is a far cry from those old wind-swept booths of centuries ago to our vast palaces of trade, some of which are virtual

Chickering Company of Boston. A rich combination of red brick and white Vermont marble. Richardson, Baroth & Richardson, Architects.

A treatment of Black and Gold marble for one of Baltimore's most fashionable shoe shops.

Vermont Verde Antique is used as a base for this shoe-store front.

Store front at Rochester, New York., designed by Charles Bragdon, Architect. Another example of the use of Verde Antique marble.

Light Gravina marble lends character and color to this grill room exterior in the Smout Building, San Jose, California.

The Sax-Kay Store, in Detroit, has a rich treatment designed by Lancelot Sukert. Bois Jourdan is used for the door architrave and the bases under the windows. The trim is dark Tennessee.

villages in themselves. Each year the business buildings of this country are more elaborate and costly. We have mercantile structures whose ornamentation and expensive enrichments easily outdo the most famous palaces of Europe. This is not surprising when one considers that a single building often totals an investment of more than $10,000,000. Rare materials from all parts of the world go into their construction. Marbles are used in unlimited quantities for the entire interior finish. Yet a building of this kind may be very modest and artistic in its effect, despite its profuse adornments.

One feature in work of this kind that is steadily growing in favor is the use of marble for store fronts. All of the fashionable business streets in our larger cities present a surprising number of fronts that are finished in colored marbles. There is such an irresistible attraction about marble that these store fronts, finished in white, black and white, black and gold, variegated, or green marbles, have a psychological effect on shoppers, in whose eyes they stand as an index to the business carried on within. Frequently, too, there are columns or panels of the more highly colored and richly veined

marbles. Verde Antique is gaining wide popularity and is often used for store entrances. The Walk-Over Shoe Company uses it exclusively in their standard fronts for the bases under the show windows. Its hardness and susceptibility to a high polish render it ideal where an attractive, as well as enduring, material is required. These instances of color and variety charmingly relieve the dullness and uniformity of our city streets.

The growth and expansion of advertising in the last decade has created a desire in all business concerns to differentiate their products in such a way that some well-defined characteristic, or a certain desirable quality, will carry an appeal to the buying public. This tendency is reflected in the retail trade by the demand for store fronts of pronounced individuality. Many of them are now actually planned to conform to the recognized principles of good advertising, and in this respect, marble is being widely used as the medium to bring about the desired effect. Sometimes only the basework and sills are fashioned from this material; sometimes, however, the window flooring, cornices, and the complete exterior ornamentation are built of it. Fronts composed of marble extending to the roof are not uncommon sights. Very often the exterior effect is admirably supplemented by the

The "Linen Mart" in Baltimore has an all-over marble front. The upper portion is Georgia; the lower, Verde Antique. E. G. Blanke, Architect.

interior, containing floors, counters, paneling, and columns of marble, which provide an appropriate and pleasing, as well as a most practical, background.

Unhappily for architects, the external appearance is not the only problem in designing a building of this kind. There is the question of permanence. Specific instances are already on record which testify to the strength and enduring qualities of marble. In San Francisco's great fire of 1906 many buildings were ruined by the intense heat. The marble front of the Security Bank remained intact while adjoining buildings crumbled under the strain. Only recently in the Santa Barbara earthquake we find marble surviving another disaster. The San Marcos Building of this city had its outer walls reinforced with concrete. One end fell to the ground. In the part still standing are five stores with fronts of Alaska marble. Of the thirty-three pieces of marble in these fronts, not one was cracked or broken. There were also many Verde Antique fronts in the different buildings. Without exception the walls and ceilings were badly damaged, but these fronts show no effects of the quake.

Considering its endurance, the cost of marble for this purpose is not excessively greater than that of any other building material, and when the lower cost of upkeep and infinitely greater attractiveness are taken into account, the argument leans decidedly in favor of the more pleasing and lasting stone. Marble requires no redecorating and when given an occasional cleaning retains its newness, as well as its color and texture, for a vastly longer period than do other materials. It has, therefore, practically no depreciation. With richness, beauty, and dignity combined with that most wished for quality, permanence, marble is remarkably well adapted to work of this character.

Jewelry and drug stores in Oakland, California. A practical use of Verde Antique. Walter J. Mathews, Architect.

For Everyday Use In The Home

The use of marble for the bathroom is *not* a luxury. In fact, taking into consideration only its first cost and its lasting qualities, it is the least expensive material to be had.

Moreover, complete satisfaction in bathroom appointments can only be obtained by marble floors and wainscoting. Such a room is clean and inviting, and worthy of being introduced to any guest.

THE LIBRARY AT CHARLOTTESVILLE, VA.

By Walter Dabney Blair

JEFFERSON was an admirer of Roman architecture and its tradition and in his plans for the University of Virginia at Charlottesville, Virginia, drew inspiration from its monumental buildings. His resources, however, were not equal to his aspirations and so he was compelled to make cornices, door and window architraves and pediments of wood, which in sections followed the scale of stone. He used wood, not in accordance with its own structure, but frankly in imitation of stone.

The difficulty of columns and pilasters was met by building them of brick which was afterwards stuccoed and given the proper entasis. The bases and capitals of columns were made of marble, which was imported from Italy, as neither material nor carvers were available at that time in Virginia.

In designing the Public Library for Charlottesville, which was the gift of Mr. Paul Goodloe McIntire to his native city, it was decided, for reasons of economy, to follow the Jeffersonian tradition of using, for the main cornice of the building, wood in imitation of stone. The base courses, columns, pilasters, balusters and keystones were made of Georgia marble. As horizontal joints across the shaft of an unfluted column are disturbing to its unity and therefore to its decorative effect, the columns were made of monoliths. The additional cost over having them of horizontal drums was fully justified by æsthetic reasons. The capitals, of which the design required elaborate carving, had to be constructed in terra cotta, which in this particular instance so well stimulates marble that the average person does not realize the deception.

The plan of the building demanded a blank wall on the main façade, which faces west on a small park adorned with a fine equestrian statue of General Lee, by Shrady

The combination of brick and marble in the Charlottesville (Va.) Public Library is most effective. The architect was Walter Dabney Blair, of New York.

and Lintelli, both park and monument also the gift of Mr. McIntire. The entrance from a sloping street presented an interesting problem and was solved by a semi-circular projecting porch, flanked by blank walls adorned by niches, in which large decorative vases of Georgia marble were placed. This porch is approached by marble steps which circle its flanks. The porch ceiling is decorated with recessed panels; and a semi-circular rinceau band of ornament surrounds a sunburst which serves the utilitarian purpose of ventilating the roof space.

On the south and east of the building there is a small garden with paved brick walks, seats and steps. Marble balustrades enclose it. In the center of the building is an elliptical recessed porch, with two monolith marble columns and two pilasters; marble steps 21 feet wide descend to the garden. The east wall of this garden has been built up somewhat higher in the center to form a background for a marble pedestal with a seat on each side.

The main entrance is an arched opening 16 feet high, the bottom of which is filled with side lights and double doors crowned by an ornamental frieze and a broken pediment. On the interior throughout the first floor the borders and bases of all the rooms were made of Black and Gold marble, the floors of cork. In the center of the delivery room a large and circular insert of Black and Gold marble reflects the domed ceiling above. The floor of the vestibule was made of colored marbles, Levanto, Verde Antique and Black and Gold, in a simple geometrical design.

The vestibule opens into the delivery room, which has a shallow decorated dome and rich modillioned cornice. This room is painted gray, while the reading room and vestibule are painted different shades of light yellow and tan.

The reading room, 23 feet wide by 40 feet long, has a ceiling height of 21 feet; it is lighted on the east by one window and on the north by three. These windows are wide and high, with circular heads, and are subdivided by muntins. Window shades, which are so hopelessly inartistic, have been replaced by ecru colored curtains, which give to the room an appearance different from the institutional aspect of the usual library. To emphasize this difference, Italian furniture of the eighteenth century, selected for its beauty of design, upholstered in linen, velvet, and tapestry, has been used and has been combined with old Colonial Windsor and painted chairs. The reading tables and paper racks are of walnut and were designed by the architect. The reading lamps have parchment shades decorated with colors to harmonize with and supplement the colors of the furnishings. The aim of the architect was to create an atmosphere of refinement and culture in a reading room which would entice and refresh the readers, with color, beautiful fabrics, and fine examples of furniture.

In the delivery room two console tables with tops of Formosa marble were designed by the architect so that the delightful color of that marble might be seen against gray painted walls.

This small one-story building is an example of how marble may be used in small amounts to give distinction and quality and charm of color to more ordinary building materials. It demonstrates that in small buildings, as in large and costly ones, marble has its legitimate use. Its presence adds a beauty otherwise unobtainable, a savour of legendary delights. In the colors of marble romance dwells. They are imagination's bridge back to the palaces of Sheba and Solomon and the great civilizations of the past.

THE BANK OF NOVA SCOTIA AT OTTAWA, CANADA

By JOHN M. LYLE

THE Bank of Nova Scotia was founded in 1832—and is the second oldest bank in Canada. The head office, from which center are controlled the vast enterprises grouped under the name "The Bank of Nova Scotia," is situated in Toronto. There are 296 branches—259 of which are in Canada and the balance in Newfoundland, Cuba, the West Indies, the United States and England.

Having in mind the international character of the bank's business the directors

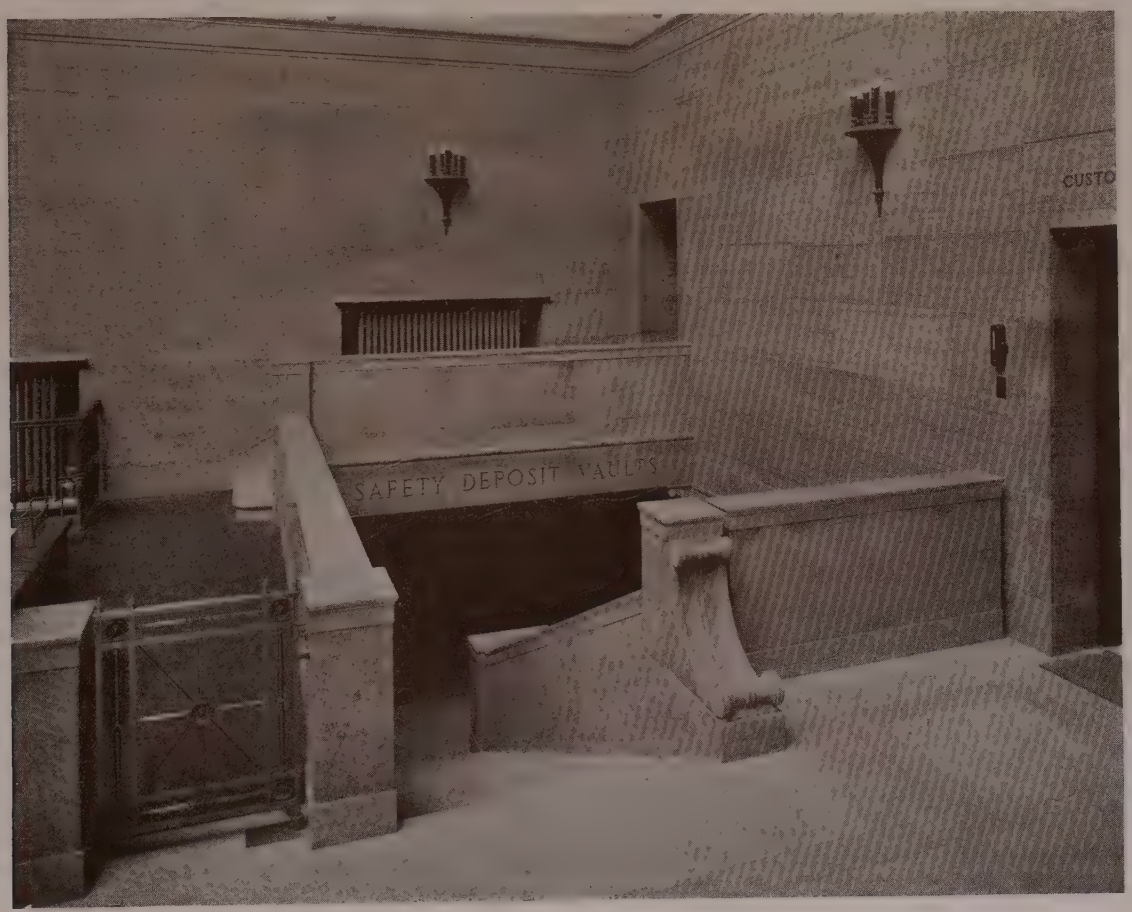
wished to be represented in Ottawa, the capital of the country, by a building which would meet the practical needs of their customers, and in addition arrest the attention by its architectural interest. There was the added reason that the bank should have an outstanding building, as Ottawa had been the headquarters of the late Bank of Ottawa which was amalgamated with the Bank of Nova Scotia.

The style of architecture selected for this building was a modernized adaption of the

View of the Main Banking Room. Architects, Ross & Macdonald. Associated architect, John M. Lyle.

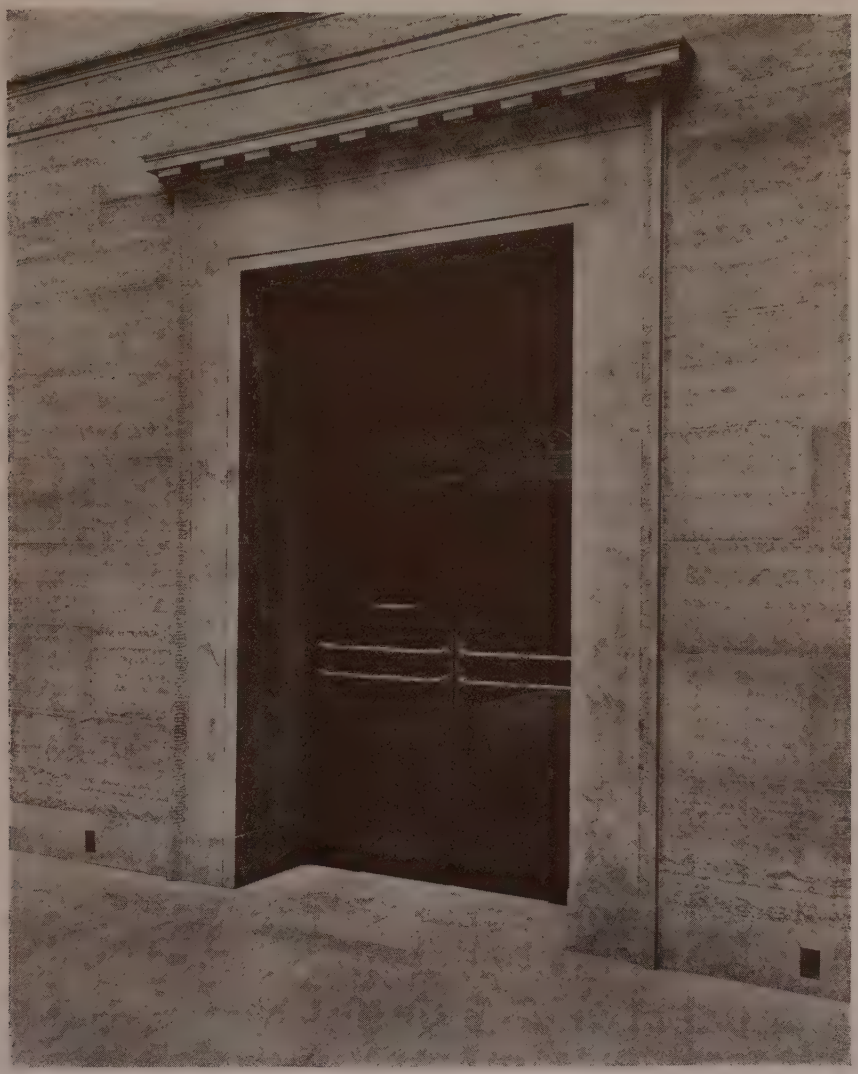
Grecian Doric. The designers studied carefully the masterpieces of ancient Greece, and with this foundation they endeavored to solve the problem presented in a natural and, at the same time, a personal manner. Different architectural elements have been married together, to produce a building which will harmonize in its different parts. Running throughout the whole building, from the corner stone to the electric-light fixtures, the furniture, door knobs, etc., are to be found the spirit of the Grecian Doric style. While Classic in its conception, this building is not a slavish copy of some Grecian temple; it is not "stale" architecture, but alive in its modernity and expressing on its façade the internal plan.

The façade itself is of buff limestone and is a fine example of stone and of stonesetting. The alignment of the mouldings and the sharpness of their arrises, are noteworthy. The carving was executed by a master craftsman—Mr. Ira Lake—and will repay careful study. Generally speaking, the projections of the carvings are very slight, and the value of light and shade is obtained by subtle modelling. While the principal idea in the carving is to obtain a decorative effect in the play of light and shade, and a resulting contrast between the plain wall surfaces, it is also symbolic in its intention. Over each of the large windows is a decorative panel, the center one bearing the coat-of-arms of the Bank of Nova Scotia, and the side panels having the overflowing horns of plenty. Between the



Stairway to Safety Deposit Vaults.

Detail of Marble Counters and Bronze Grilles in one corner of the Main Banking Room.



Main Entrance Door to Banking Room.

trygliphs in the frieze of the cornice are placed emblems indicative of Agriculture, Lumbering, Manufacturing, Fishing, Finance and Marine Commerce.

Entering through large mahogany doors, one comes first to a marble-walled vestibule treated in Kasota Veine; then, through bronze doors, one reaches the main banking room, which is 85 feet long by 62 feet wide and 46 feet high. As you enter this room you are immediately struck by the beautiful soft glow of the interior. The floor is Pink Tennessee; the counter base, tops, check desks, marble seat and trim around main entrance door are St. Genevieve; the field of the counters is Kasota Fleuri and the ashlar on the walls to a height of 14 feet is Kasota Veine. Above the marble, the walls are of cast Caen stone, tooled surface and mica admixture, with a tone very much like the marble, but not in any sense appearing like an imitation marble. The ceiling treatment is brought up in soft tones of dull gold and gray, the center skylight section being still more pronouncedly golden. The inside glass skylight was given two coats of

varnish to soften the white glare. The result of the combination of the Pink marble in the floors with the Kasota Fleuri and St. Genevieve counters, the Kasota Veine of the walls and the bronze cages, gates and electric-light fixtures, is that the interior is actually flooded with a soft radiant glow, almost equivalent to sunshine. It is this departure from the cold austere type of banking interior that has called forth so many favorable comments from the press and public. Large scale treatment of the marble slabs has been the rule; all possible mouldings have been elminated and the restraint in design is constantly in evidence, thus allowing the beauty of the material to count to the full.

From the main banking room, easy marble steps lead to the safe deposit vault section below. Polished steel grilles divide the customers' room of this section from the public entrance, and ample accommodation is provided in the form of coupon booths and desks. The vault proper is of the island type, surrounded by a patrolled corridor. The outside walls of the vaults are of heavily armored concrete, and the inside walls of specially prepared steel linings of several thicknesses. The vault door, weighing ten tons, is of the very latest design and a splendid example of the vault maker's art. The floors of the safe deposit section and steps of staircase are of Ross Pink Tennessee; the walls of the staircase and vestibule of Kasota Veine, and the floors of the vault are of polished Ross Pink Tennessee with a border of polished Belgian Black.

The arrangement of the counter and tellers' cages follows the Canadian practice of enclosing only the tellers and leaving all other spaces at the counter open. In order to have privacy for the work desks at the counter, a low bronze and glass screen is set back from the marble counter face, so making it impossible for anyone in the public space to see over this screen. This type of counter permits every one of the clerks, excepting the six tellers, to work in the open and does away with the prison aspect so noticeable in American banking interiors.

Carved Kasota Marble Panel over one of the doors in the Bank of Nova Scotia, Ottowa.

Fireplace and mantel of marble in the room of Ruggieri, Catherine's astrologer, in Chateau of Chaumont on the Loire.

THE STYLE OF FRANCIS I

Classic Elements Began to Dominate the General Composition of French Architecture

PART III

CHAUMONT and ST. GERMAIN-EN-LAYE; with a retrospective sketch of PIERREFONDS

AMONG other examples of the Francis I style in the Loire Valley provinces or the nearby districts are Chaumont and parts of Usse, both of them remodeled at this period.

The Chauteau of Chaumont is southwest of Blois, on a bluff that overlooks the broad basin of the Loire itself. The situation is one of the happiest in a region that is altogether charming; long reaches of the winding river are visible in both directions, and wooded slopes and green plains stretch gently away

Illustrations courtesy Thomas Machen, architect, Baltimore.

Entrance to Chateau of Chaumont, showing the towers and portcullis.
Renaissance details are in evidence.

from the water's edge to the back country.

In the time of the early Angevin Counts, Chaumont served as one of the outposts of the Counts of Blois toward their enemies' country, and was a border castle of France. It was given to Gelduin, whose son was the first of that famous family of D'Amboise. The first castle was razed to the ground in one of the perpetual wars with Henry Plantagenet. During the early struggles between the Kings of France and England, Chaumont was frequently attacked, and as frequently changed hands. In 1169 it was in the hands of the English when Henry II met Thomas à Becket there just before the latter's murder. There is no very clear account of when or how many times the old chateau was rebuilt, but we do know that during the fifteenth century, in the reign of Louis XI, we find it in the possession of the Amboise.

One of the Amboise, Pierre, counted too heavily upon the favor of the despotic Louis XI and found himself in disgrace and his chateau destroyed following too strenuous opposition to the royal wishes. The family was too powerful to remain long without a home. This power was increased by the subtle statecraft of Pierre's son, Georges Amboise, who became one of the leading diplomatists of the day. He arranged Louis XII's divorce from the Princess Jeanne and received as a reward a cardinal's hat. His brother Charles had begun the rebuilding of the ancestral home, and Louis XI is said to have defrayed a

Interior of the court, balcony and stairway,
Chaumont-on-the-Loire.

large part of the construction costs. The body of the chateau was probably completed before the beginning of the sixteenth century, though Philibert de l'Orme, whose earliest date is 1531, is frequently given credit for its erection. However this may be, it is probable that later additions and some embellishments were the work of de l'Orme. Just what these consisted of is problematical, since practically all the features of importance at Chaumont resemble earlier work than that which de l'Orme, who was an architect of the early Renaissance, represented. The classical features found in Chenonceaux are almost entirely missing; it appears to stand in a chronological order just ahead of it and after Langeais.

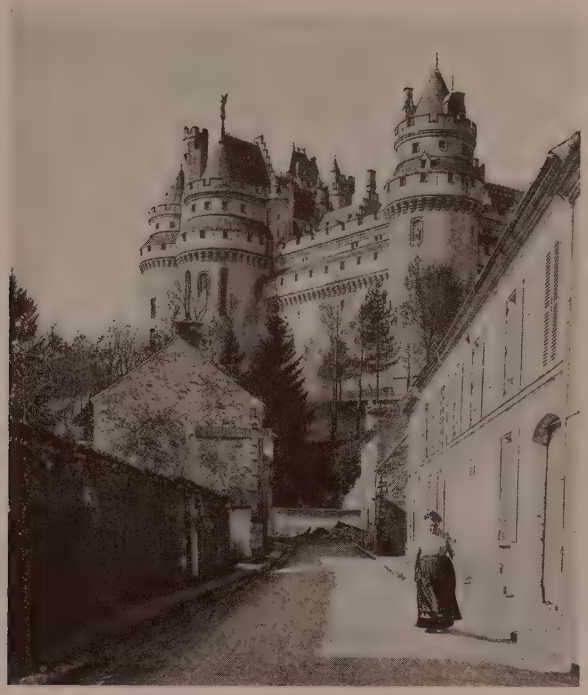
Chaumont is not a palace. It is small in comparison with such massive piles as Chambord and Chenonceaux. It is, however, a compact and almost perfect type of the transition noticed at Langeais from the fortress to the later chateaux. The walls and the ground plan are still fundamentally those of a Gothic fortress. Each angle is covered by a round tower and the composition depends wholly on these corner towers for the necessary amount of perpendicular

ascent. The entrance is still guarded by two great towers. On the left side towards the river is another, binding together the corners of the *corps de logis* originally built by Charles in the form of a quadrangle. Before the wing facing the river was thrown down in the early years of the eighteenth century the four wings surrounded a court. In the space that is now opened, there is a fine terrace looking out on the Loire, and showing an appreciably preponderant Gothic influence. Distinctly Renaissance work is difficult to find. The very rich cornice under the Flamboyant tracery of the gallery that guards the upper windows is one example of such work; other specimens may be seen in the delicate carving surrounding some of the windows and set into the paneled buttresses.

An overhanging battlemented gallery is roofed over, like at Langleais, forming a continuous covered passage crowning the full extent of the outer wall. The skyline is very broken and irregular, as in most Gothic work, and the roofs are steep and the towers sharply pointed.

To the left of the entrance gate is the

Sub-basement of the Grand Stairway in Chaumont, showing the fine Renaissance details.



Pierrefonds, the mediaeval.

Cardinal's Hat and a coat-of-arms of Georges d'Amboise; on the inside of the wing that joins the entrance towers is the porcupine of his master Louis XII. "The heraldic emblazonments at Chaumont," wrote Clara C. Perkins, in her French Cathedrals and Chateaux, "are not only exceedingly decorative but serve to recall much of the history of the chateau. A broad, continuous band on the exterior wall bears, alternately, interlaced C's and a cone-shaped figure. The C's are the cipher of Charles d'Amboise, Charles of Chaumont. The cone-shaped figure is his device. It represents a burning mount, the 'chaud mont,' from which the chateau takes its name."

Chaumont is closely associated with the names of important personages in history. Catherine de Medicis spent nights there and her initial as well as that of her rival, Diane de Poitiers, appears intertwined with the H of her husband, Henry. The room of Diane was built in the thickness of the entrance tower, with Catherine's room just beyond. Prince de Conde was imprisoned at Chaumont. Cinq Mars and Philip V of Spain, as well as Benjamin Franklin, Voltaire, Madame de Staël and Madame Recamier, were all at one time or another entertained beneath its roof.

Today the old floors of red tiles are oiled and polished to their ruddiest shade, and everything within and without is peaceful. The portcullis hints of wild attack and the grim towers suggest mediæval savagery, but their usefulness was hardly ever needed more than they are today.

The country round about Paris was, next to the Loire Valley, the country most frequented by the Court and two of the most prominent of these buildings are the castle of St. Germain-en-Laye and the palace of Fontainebleau. St. Germain was remarkable among the buildings of Francis I in many ways. It had nothing of the gayety of the Loire chateaux and showed neither profuse and delicate ornament nor their

picturesque steep roofs. It presents, on the contrary, the frowning aspect of a fortress—and is crowned with a balustraded terrace.

The use of brick plays an important part in St. Germain, just as it does in at least one other building on which Pierra Chambiges, the master mason, appears to have been employed: La Muette. It is used for pilasters and other decorative features, and both for dressings in combination with ashlar and plastered walling and as walling material with stone dressings. Though Chambiges is not considered usually as an architect, yet his elevations have enough merit to entitle him to be ranked as one of great architectural capabilities. While we know that there is no record of any architect being employed, it is of course entirely possible that one of the Italian architects then in France may have been responsible for the designs of both St. Germain and Muette.

A royal castle existed on the site as early as the reign of Louis XI, from 1108 to 1137. Of the present buildings, the only portions older than the sixteenth century are the chapel built by Louis IX and the donjon rebuilt by Charles after its burning by the English in 1356. Francis I pulled down what was left of the structure and rebuilt mostly on the old foundations, bringing the older fragments into harmony with the new scheme. Under Louis XIV, Mansart added five ungainly pavilions at the angles, but these were afterward removed.

The fortified castle stood on an eminence overlooking the Seine. As transferred by Francis into a pleasure house, it has a court of irregular plan, rhomboidal in shape, as determined by the limits of the old structure. The balustraded roofs, as above mentioned, are broken only by the massive chimney stacks and the cupolas over the staircases. "These terraces," says W. H. Ward, "are of stone and carried on vaults maintained in equilibrium by the Italian system of iron ties and the French one of external buttresses, both used concurrently at the time of erection. The boldly projecting buttresses divide the elevations into narrow bays and strongly accentuate the element of verticality. They are treated on face and sides with straight pilasters and crowned with stone urns. Two balustraded galleries on semicircular arches run from buttress to buttress, and single or coupled openings framed in pilasters and with semicircular heads occur in the recesess thus formed. The different elevations exhibit slight variations on the same theme. Circular stair turrets occupy the angles of the court, and the chapel, a graceful specimen of thirteenth-century Gothic, stands across the southwest angle of the trapeze, thus forming a short fifth side. Its buttresses were carried up above the roof, where they were treated with pilasters like their neighbors, and the upper gallery was continued over them in the form of a bridge—a very successful attempt to harmonize two antagonistic styles without detriment to the proper character of either.

"Externally the angles of the castle are emphasized by massive towers of irregular plan. In the intervening façades the buttresses are not continued below the level of the lower terrace, which is carried on a projecting gallery corbelled out as far as the face of the tower and forming a chemin de ronde. The total effect of the building, depending as it does hardly at all on ornament, is original, if somewhat gloomy."

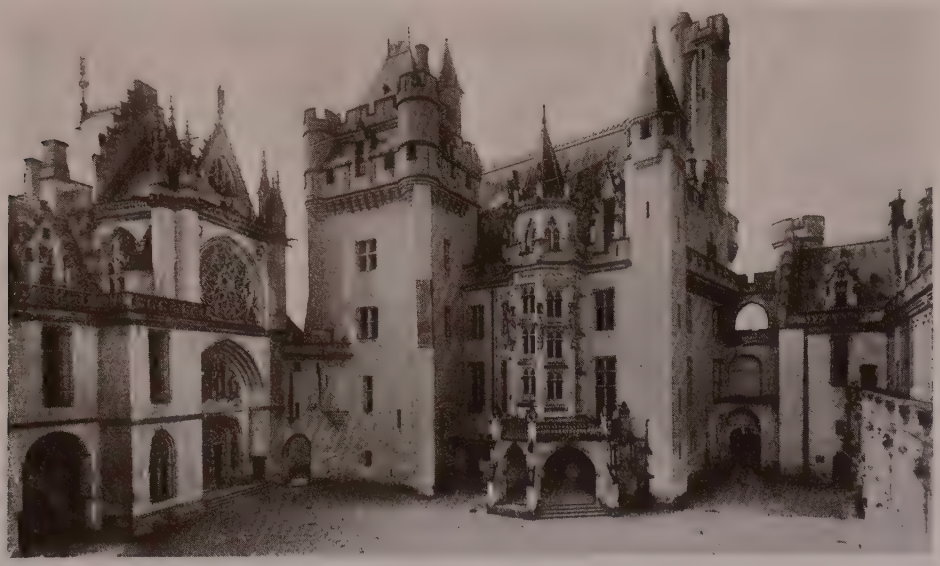
Before leaving the early Renaissance characteristics as contained in the castles and chateaux of France, and passing on to a brief survey of the ecclesiastical structures of the period, it is advisable, for greater contrast, to mention again some of

the salient features of the period that preceded. No better example for our purpose could be found than the Chateau of Pierrefonds. We can see, by this retrospective glance, just how far forward the influence of the Italian school had brought the French-Gothic.

Pierrefonds stand on a high hill overlooking many miles of country. The ground plan is a quadrangle; the walls are of enormous thickness, with eight massive circular towers, very tall and crowned by cone-shaped roofs, sharply pointed at the apex. The openings are small and few, and the walls and towers are machiolated and battlemented with loopholes between the embrasures. Portcullis and moat guard the main entrance.

The inner court has opening upon it the windows of the various halls and compartment. Some of these windows are coupled, with foliations set in their heads; a few are pointed. Flamboyant tracery half fills one large window. Crocketed gables and finials, carved mouldings, gargoyles, traceried balustrades—indeed, all the trappings of the earlier Gothic piles—are found in profusion. The interior is interesting though not altogether pleasing, but it is the plan and thickness of the walls, their impregnability to the means of assault known to the time that was just ending that concerns us most. Behind the battlements are holes in the floor between the brackets that support its projection. These — called machicoulis — served as openings through which boiling water or hot lead could be poured upon the enemy below. One can see the slant which widens the inner face of the wall openings, to allow the grouping of a number of men whose guns could cover a wide sweep of the approach.

Traces of one or all of these war-like features continued to be found in the early Renaissance buildings, as we have shown. But, with the change from the mediæval attitude of mind, and savage life, to the softer, the more domestic existence of the sixteenth century, came a change in the character of the architecture, until, by 1550, or earlier, the influence of the fortified castle was entirely effaced.



The Stairway of Honor, the donjon and the chapel in the Chateau of Pierrefonds.

A NEW ENGLAND LIBRARY

Rockville, Connecticut, Has a Fine Type of Small-Town Building In Its Maxwell Memorial Library

IN Rockville, Connecticut, there stands a building that could well serve as a model for all small-town libraries. This Rockville structure was designed by Charles A. Platt, of New York, and is known as the Maxwell Memorial Library.

It seems to be a fact, if one may judge by the scarcity of such examples, that it is as difficult to achieve architectural unity, distinctive treatment and freedom of conception in the small building as in the towering skyscraper. The American architect has shown an increasing capacity for monumental designs of the type exemplified by the Lincoln Memorial and the state capitols of recent erection. He has to his credit, moreover, such noteworthy cathedrals of commerce as the Woolworth and Tribune buildings, though these owe indeed a certain part of their eminence to their huge size. The small edifice, on the other hand, by its very dimensions, must be all the more nearly perfect in order to obtain any recognition whatsoever.

The Rockville library deserves such recognition. The site is in itself happily chosen, being ample enough to accommodate the building and at the same time afford a spacious lawn that, surrounding it on all sides, accents the beauty of the plan. The elevation is somewhat higher than the street levels, and the architect has taken advantage of this condition to incorporate into the general scheme an approach that magnifies the actual size of the Maxwell Library.

The two flights of steps, shown in our illustration, are 40 feet wide and lead directly to the central feature—a pediment supported on eight Ionic columns. In the tympanum of the pediment is a bronze clock, the gift of Miss J. Alice Maxwell. The window openings are quite large and arched, in conformity with the purpose of the designer to give from the exterior the effect of a well-lighted room, suggesting a library. Over the small pediment of the entrance door is a carving of a book, symbolizing the purpose of the building. The entire struc-

ture is built of large blocks of Vermont marble.

The vestibule is lined with Formosa marble. On entering the building one finds himself in a large room and opposite the delivery desk. On the right-hand side is a screen separating the children's room from the reading room. The two bookcases on either side of the door protect the reading room from the casual visitor.

The main difference between this library and others of similar size is in the fact that this large room replaces the usual collection of smaller ones. This was done for two reasons: first, so that the librarian from his position at the delivery desk could see every part of the two reading rooms; and, secondly, for the beauty of the architectural effect.

The opening to the delivery room for some distance at either side, as well as the opening to the vestibule, is framed in Siena marble. It may be said that this marble, like the Formosa marble in the vestibule, is of unusual beauty. The room itself is vaulted, as suggested by the circular openings from the outside, and has a ceiling of deep blue. The cornice at the spring of the arch of the windows is highly ornamented with a relief and in it are the names of thirty principal writers of all times. Over the delivery desk is a Latin inscription: "Ex hoc fonte illa quae summa sunt havrimas." Lower down in the marble are the following inscriptions, in bronze letters: "To the Memory of George Maxwell, Born July 30, 1817, Died April 2, 1891. Of Honored Ancestry and Devoted Public Spirit. He Faithfully Served God and Man"; and, "George Maxwell Memorial Library. Presented June 29, 1904. As a Tribute of Affectionate Remembrance. Harriet Kellogg Maxwell, Julia Alice Maxwell, Francis Taylor Maxwell, William Maxwell, Robert Maxwell."

Above the Latin inscription, in the vault, is a marble clock. This clock as well as the one outside, is the special gift of Miss J. Alice Maxwell.

All the interior of the building as well as the furniture is antique oak. The floor is laid herring-bone.

Passing through the door at the left of the delivery desk, direct access is had to the stack and the staircase leading to the lecture room upstairs. At either side of the staircase, at its bottom, are two doors, one leading to the reference room, the other to the woman's toilet; and at the left is one leading downstairs to the men's toilet.

The lecture room has a seating capacity of about ninety and is lighted entirely from the north with windows separated by pilasters, and paneled under the sills. The ceiling is a barreled vault up to the platform. The platform is raised two steps. While the room has a moderate seating capacity, the acoustic properties have been carefully considered and a lecturer can be heard when reading in an ordinary voice.

The stack room has every modern appliance and has a capacity for about 30,000 volumes. The reading room has a capacity for about 8,000 books, easily accessible to everyone.

The building is lighted by electricity. The large room is generally lighted by two chandeliers, each table having individual light in addition. All the lights in the building are controlled from a switchboard within easy reach of the librarian.

The heating and ventilating is accomplished by a system of fans forcing warm air into the room above the heads of the occupants, and drawing off the vitiated air near the floor through a series of ducts, the temperature in all parts of the building being maintained to any degree by means of thermostats automatically controlled.

THE UNION TRUST COMPANY OF PITTSBURGH

Andrew W. Mellon, Secretary of the United States Treasury, Was the First President of the Institution.

THERE was organized in 1889, in Pittsburgh, a company known as the Union Transfer and Trust Company, to facilitate and safeguard the transfer of securities. Its original capital was $250,000 and Andrew W. Mellon, who later became the distinguished Secretary of the Treasury of the United States, was its first president. Associated with him were a number of the most influential business leaders of the day, including Colonel James M. Schoonmaker, who was for so long the chief executive in Pittsburgh of the Vanderbilt interests. William C. Carr was Secretary-Treasurer.

At first occupying modest quarters on the second floor of a Fourth Avenue office building, it was not long until the Union Trust Company found a more commodious home in the old Oil Exchange Building, where it remained until that landmark was destroyed by fire. The splendid banking rooms at 337 Fourth Avenue, vacated only two years

ago, were then erected and occupied in 1899.

So successfully did the new institution meet and anticipate the financial needs of the community that it enjoyed a remarkable growth. Its field was broadened, and its capital increased from time to time until it reached $1,500,000. A few years ago it was decided to build an even finer home for the Union Trust Company. The question of the site was influenced by the fact that the late Henry Clay Frick, a man of wonderful vision, believed the vicinity of the Allegheny County Court House would always remain the financial center of the rapidly expanding industrial section of Western Pennsylvania. The new building is just across Grant Street from the Court House. It is also opposite the Frick and Carnegie buildings and the William Penn Hotel. The block is bounded by Fifth, Grant and Oliver Streets and William Penn Place. The exterior of the building, which is called the Union Arcade, is considered one of the most satisfactory examples of the application of Gothic architecture to a commercial structure to be found in Pennsylvania.

Graham, Anderson, Probst and White, distinguished successors of the famous D. H. Burnham, designer of the Frick Building, Pennsylvania Station and the Oliver Building, all erected in Pittsburgh, were selected to create banking quarters that would be dignified, and at the same time utilitarian; beautiful, and yet plain and possessing pro-

Gate at entrance of the bank from Union Trust Building.

visions for rendering service to the bank's patrons.

The work for reconstruction was started in 1922, and the building was ready for occupancy by the latter part of 1923.

The new quarters of the Union Trust Company in the Union Arcade Building are in full accord with the bank's position as one of the largest and strongest financial institutions in the country. Massive grilled bronze doorways lead from Fifth Avenue and the arcade to the main banking room. This main banking room, on the ground floor, occupies an area 110 by 215 feet, the size of which makes it one of the most notable banking spaces in this country. Upon entering the main entrance, either from Fifth Avenue or from the central arcade, the spectator finds at the center a beautiful colonnaded hall, the main or central feature of which is a cella 58 feet wide and 172 feet long and rising to a height of 30 feet. At the center of this splendid hall stand two rows of marble columns, sixteen columns in all flanking the main vista and giving to this hall a monumental architectural character similar to that of the hypo-style of the Temple of Karnak, in Egypt, which since centuries before the Christian era has stood before the world as one of the most notable architectural conceptions ever built in stone. Sixteen columns in marble rising to the ceiling are of Tavernelle, the same material being used on the walls of the cella, which are penetrated by arched openings disclosing the mezzanine which surrounds the main banking room and, at the same time, furnish sufficient wall surface to give to this great room a fine impression of solidity and strength. This impression is still further emphasized by the use of a rusticated stone surface which brings out strongly the horizontal and vertical joint lines of this beautiful masonry treatment.

Grouped around the main floor are all the facilities usually furnished by our largest banking institutions. Ample officers' spaces on either side of the Fifth Avenue entrance are so placed as to bring the officers in full view and facilitate the rapid handling of business. At one side are the cages and counters devoted to commercial banking; on the other, similar facilities for the Savings Department. At the left as one enters from Fifth Avenue, and at the extreme end of the great room, are a few steps leading up to the Bond Department, which is in plain view from the main banking room and which furnishes the most ample facilities for the use of customers. These facilities consist of a separate public lobby surrounded by private offices; and a reception room and a large space for the numerous city salesmen. Grouped nearby also are the proper cages for handling customers' securities. The President's office is also on the main floor immediately accessible from the officers' space.

As an illustration of the size of the institution and the extent of its new facilities it may be added that the total length of marble counter and cage front on the main floor, exclusive of the Bond Department, is 404 lineal

Safe Deposit Department

Marble stairway leading to the Bond Department on the main floor.
The floors are Tennessee, the remainder Tavernelle.

feet. A notable development of recent years in banking practice has been the special facilities provided for women. In this matter the Union Trust Company has gone much farther than is usually the case, in providing very ample facilities in the way of private waiting rooms for the use of lady customers of the bank. The style of the interior as to architectural detail is inspired by the foremost examples of Greek and Roman work. It may be called classic architecture freely interpreted to meet the requirements of modern buildings. It is severe and plain in its general character with a moderate use of ornament in a very reserved key, the main impression being that it is not lacking in elegance, but is primarily dignified in appearance.

On the mezzanine or second floor, reached by special stairs and elevators, are the Trust Department, Real Estate Department, and also the special rooms, including large directors' rooms for the use of the officers. An important feature of the second-floor departments is the fine open lobby and waiting rooms encompassing a full view of the bank.

The Safety Deposit Department on the basement or ground floor level is reached by means of stairs and elevators from the main banking or first floor level and it also has a direct entrance from the Arcade on the ground floor level. The entrance is through

beautiful bronze grilles near which are the offices of the officers in charge of the Safety Deposit Department. Near at hand are special retiring rooms for women; retiring rooms for men are also conveniently located nearby. Passing the office one finds oneself face to face with the great circular door of the main vault. The door is 24 inches thick and weighs 60 tons. The Safety Deposit vault is 45 feet by 60 feet, being one of the largest installations of the kind thus far constructed. The rear door from the vault leads to the coupon and committee rooms, of which there are a great number, of sizes varying from the small coupon booth room for one person up to large committee rooms suitable for large meetings. The size, the arrangement, and the elaborate facilities make this perhaps the most notable and most ample Safe Deposit Department in the east.

Of considerable interest is the treatment of the main doorways leading to this bank. Both doorways (namely, that from Fifth Avenue and that from the inner arcade) are 17 feet wide and 30 feet high, built of beautiful polished bronze, ornamented in the spirit of the Gothic decoration characteristic of the architecture of the Arcade Building.

The marble work in the Union Trust Bank Building is both well planned and excellently carried out. The materials used are mostly Tavernelle, with Tennessee marble floors, though several of the toilet rooms are executed in white Italian and others in Carthage marble.

Lobby of Trust Department on mezzanine floor,
Union Trust Company of Pittsburgh.

A LIST OF THE WORLD'S MARBLES

By J. J. McCLYMONT

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

GROUP A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

GROUP B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

GROUP C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

GROUP D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

Paragone

Quarried at Santa Maria del Bosco, Bergamo, Italy.

Black. (Blagrove.)

Takes high polish.

Parbatsar—See Gray Makrana, Pink Makrana and White Makrana.

Parenso—See Orsera.

Parian

Nymphs Grotto Quarry, near St. Minas, and other quarries on Mt. Capresso (Ancient Mount Marpesius) on the Isle of Paros, Ægean Sea.

These quarries are believed to have been worked as early as 600 B.C. Originally the marble was obtained from subterranean quarries or tunnels driven horizontally or at a descending angle into the mountain. Several of these tunnels are in existence and sometimes worked.

The Parian marble is perhaps more widely known than any other statuary marble. Many small pieces of statuary made from other less famed and inferior white statuary marble, and sometimes from Alabaster or a composition, are sold as Parian marble.

The ancient stone is pure white statuary and takes a good polish. The modern Parian marble is coarse grained and the white statuary variety is obtainable in small pieces only. The common variety is white with straight or crinkly veins. Much of the marble from Naxos, an island separated from Paros by a narrow channel, is sold for and is similar to the modern Parian marble.

Parian Statuary

Quarried on Mount Capresso (Ancient Marpesius), on the Island of Paros, Ægean Sea, Greece.

Pure white, slightly translucent.

Obtainable in small pieces.

This quarry was opened early in the sixth century B.C., and was known as Marmor Parian, Lychnites and many other names.

Many of the small statues sold as Parian marble are Alabaster, while others are merely composition.

Pario

Same as Parian.

Pario Giallognolo

As Parian marble is known to assume a yellowish tint upon exposure, the name Pario Giallognolo is no doubt given to Parian marble that has become yellowish.

Parisian Marbles

The marbles quarried near Paris, France, are mostly of a yellowish or brownish-white, with brown or brownish-gray spots.

Parker Quarries—See Gray Ipplepen.

Parkmoor Quarries—See Irish Black.

Parmazo—Group A

From the Miseglia, Pescina and Bocca del Frobbi Quarries, Tuscany, Italy.

White or whitish, with very coarse black or blue black veins.

Takes a good polish.

Parois Marble—See Lumachelle des Argonne.

Parona—Group A

Quarried at Monte Altissmo, Seravezza, Tuscany, Italy.

Pure white statuary, slightly coarser than the Altissimo Statuary which is quarried on Mount Altissimo, but from a higher level.

Takes good polish.

Paronaxia

Is a name given to the islands of Naxos and Paros.

Paros—See Parian.

Partridge Eye or Oeil de Perdrix.

Name given to Griotte marbles with numerous small, pearly-white spots.

Pas de Calais—See Joinville, Napoleon and Noir Francais.

Passiflora—See Gray Kunzendorfer.

Patalia District—See Indian Gray.

Patina

Name given to white marbles that show a mellow light golden tint after exposure to the atmosphere.

Patterson

Near Patterson, Caldwell County, North Carolina, is found a serpentine marble which, according to Geo. P. Merrill, is dark greenish-black and contains fine veins of yellowish-green and takes a good polish.

Pavanazzo Antico—See Antico Pavonazzo.

Pavanazzo Italian—See Italian.

Various quarries near Carrara and Seravezza, Tuscany, Italy.

Pavanazzo No. 1—Group D.

Cream background, with numerous flat veins of purple or purplish-black.

Pavanazzo No. 2.

Same as No. 1, excepting, background is white and creamish-white.

Pavanazzo No. 3.

Same as No. 2, excepting background is white.

All take a good polish.

Pavanazzo Numidian or Paonazzo—See Numidian Pink.

Pavonazetto or Pavonazetta.

This ancient marble as well as the list that follows, which have a Pavonazetto prefix, are all supposed to have been quarried near the ancient city of Synnada, in what was then known as Phrygia, Asia Minor. The site of Synnada is now known as Kara-Hissar in modern Docinenium, but inasmuch as there are several towns in this locality known as Kara-Hissar, the exact location of the quarries is indefinite.

One writer gives the location of these quarries on the River Mendere about 120 miles east of Smyrna on the west coast of Asia Minor. This last statement is surely wrong.

The descriptions and names are taken from Pullen's "Ancient Roman Marbles." Generally these marbles have "very dark brownish-purple background, with hue of clotted blood and slightly of metallic texture, large pebbles of semi-transparent creamy - white, tinged with orange or green." The different varieties which are known by the names given vary from the above only to the extent mentioned:

Pavonazetto Ad Inchiostro

Dark with inky streaks.

Pavonazetto Argentino

Silvery.

Pavonazetto Argentino Reticolato

Fine network of silvered purple.

Pavonazetto Azzurrigno

Light blue with fragments of yellowish and greenish-white.

Pavonazetto Bianco

Nearly white.

Pavonazetto Bianco Venato

Pinkish-white with reticulated veins.

Pavonazetto Bigiastro Reticolato

Network of purple and silvery and white.

Pavonazetto Bigo Brecciato

White pebbles, on finely mottled grayish-purple.

Pavonazetto Bigo Brecciato Argentino

Grayish pebbles, with flush of silver.

Pavonazetto Bigo Verdognolo Brecciato

Grayish pebbles, with tinge of green.

Pavonazetto Brecciato

Purple with fragments of white.

Pavonazetto Brecciato Argentino

Silvery hue.

Pavonazetto Brecciato Dorato

Dark chocolate with flushed and crystallized white pebbles.

Pavonazetto Brecciato Fiorito

Metallic golden-green, with pebbles of pinkish-cream and gray.

Pavonazetto Brecciato Minuto

Reddish-purple crammed with minute fragments of livid white.

Pavonazetto Cenerognolo

Ashy green, pure purple and white.

Pavonazetto Cupo
Very dark purple, with yellowish-white pebbles.

Pavonazetto Cupo Reticolato
Beautifully netted.

Pavonazetto Dorato
Purple, flushed with gold.

Pavonazetto Nero
Purple, almost black.

Pavonazetto Policromo
Handsome blending of purple and lilac shades.

Pavonazetto Sanguigno
Beef red with fragments of reddish-white.

Pavonazetto Sanguigno Confuso
Similar but lines less distinct.

Pavonazetto Scuro Angoloso
Brown with yellowish-white pebbles.

Pavonazetto Tigrato
Uniformly distributed pools of lilac and white.

Pavonazetto Turchiniccio
Small oblong white fragments on bluish ground.

Pavonazetto Venato
Here and there a vein of bright green.

Pavonazetto Verdiccio
Greenish-purple with pebbles of livid white, and yellow.

Pavonazzo (American)—Group B.
Vermont Marble Company Quarries, West Rutland, Vermont.
Milk white with dark blue-greenish plicated beds of irregular width and distribution. (Vermont State Geological Survey.)
The marble from Eastman's Quarry, West Rutland, Vermont, is similar to the one just described.
Takes fair polish.

Pavonazzo (Ancient)
Quarry unknown.
White with spots of deep red.

Pavonazetto (Modern)—Group C
Quarried near Seravezza, Tuscany, Italy.
White with cloudy violet bands and dark green veins.
Takes a good polish.

Pavonazzo Cipollino
Same as Cipollino Pavonazzo.

Pavonazzo de Numide or Pavonazzo Numidian.
Similar to Numidian Pink, but the color is not so evenly distributed.

Pavonazzo Occhiuto Alabastro
Same as Alabastro Pavonazzo Occhiuto.

Pavonazzo Scuro Cipollino
Same as Cipollino Pavonazzo Scuro.

Pavonazzo Yellow—Group B
Quarried at West Rutland, Vermont.
Milk white with green veins which are bordered with light yellowish-salmon color.
Takes fair polish.

Payalvo
Payalvo Quarries, near Thomar, Estremadura, Portugal.
Delicate light colored with thick white and orange veins and slender red markings. (Watson.)

THROVGH THE AGES

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Loggia of the G.A.R. Building at Topeka, Kansas, a brilliant creation in Vermont marble.

THROVGH THE AGES

A Monthly Magazine devoted to the uses of Marble – its universal adaptability, beauty, permanency and economy.

VOL. 3 FEBRUARY, 1926 NO. 10

A STUDY OF THE RESISTANCE OF MARBLE TO THE ACTION OF SALT SOLUTIONS

With Tests Designed Especially to Parallel the Conditions of Actual Usage

By D. W. KESSLER

(By permission of the Director of the U.S. Bureau of Standards)

IN the diversified uses of marble, the material is often unintentionally exposed to very severe conditions; hence it is a matter of importance to determine what may reasonably be expected of it when thus exposed. Such information will not only serve to explain past failures but may lead to a more intelligent use of marble in future installations.

From the standpoint of the designing engineer, the properties of marble are such that there need be no concern on his part in regard to its behavior in the structure. A high strength, a very low porosity and a reasonable degree of hardness adapt the material to almost every use in a structural way. Perhaps these merits are largely responsible for misleading many into the belief that it cannot be abused. A close examination of a variety of marble installations will reveal very few cases where the material has not given a good account of itself, but the few cases in which it has not proven entirely satisfactory are sufficient justification for serious study of the fundamental causes of the trouble.

When the National Association of Marble Dealers established a fellowship at the U. S. Bureau of Standards for the study of various problems of interest to the industry, this problem was among those assigned. A few cases of trouble in actual use were pointed out by certain producers of marble. The nature of the decay and the conditions of use led to the belief that all of these cases could be accounted for by a disintegrating action which has been found under some circumstances to affect all types of natural and artificial stone. The action referred to is that due to the formation of crystals of extraneous matter in the pores, seams or minute crevices of the stone. Some building materials contain a considerable amount of water-soluble salts and if a large amount of water leaches through such materials it carries the soluble matter to the surface where it is deposited as an efflorescence. The efflorescence is composed of the salt

FIGURE 1 shows the test to determine the effect of salt solutions on various imported and domestic marbles.

crystals which form as the water evaporates from the surface of the wall. The crystals which form on the surface of the stone are probably of no consequence except for their discoloring effect. But those which form in the pores or crevices exert a strong wedging action which often results in spalling or blistering the stone.

A chemical examination of the efflorescence matter collected from the walls of buildings indicates that the composition may vary in the various cases but that it is always of such a nature that it can be dissolved in water. The sources of the efflorescence matter may be as varied as its composition. It may be leached out of the material in the wall; it may come up out of the ground and show on the lower parts of the building; or it may be leached out of soot which collects on exterior ledges. There is also evidence that near the seacoast the fine spray from the ocean is carried some distance by winds, and sea-salts find lodgment on the roofs and ledges of buildings, becoming a source of efflorescence. Since quite a number of salts have proven to be

harmful to masonry in general, due to their crystallizing action, the subject was considered worthy of an extended study with a view of determining the ill effects of various salts on marble in general as well as the relative effects on different marbles.

The salts used in the original series of tests include only those that are known in practice to come in contact with marble. These are as follows: Sodium carbonate, sodium bicarbonate, trisodium phosphate, ammonium carbonate, sodium chloride, magnesium sulphate and sodium sulphate. The first four of these are used in various cleaning preparations, while the last two occur in small amounts as impurities in brick, mortar and natural stone. Sodium chloride sometimes occurs in brick and is of common use around soda fountains. Any of these salts which occur as impurities in building materials used in the main walls of buildings are apt to be leached out under damp conditions.

Since the disintegrating action of these salts is slow, the test must be continued over a period of several months in order to obtain results. The test method used was as follows: Slabs of marble were sealed to the tops of tall glass tumblers, by means of a circular groove in the marble filled with pitch. Glass tubes about 10 inches long were sealed in holes through the center of the slabs. The glasses and tubes were then filled with the various salt solutions. As the solutions penetrated the marble the level in the tubes would drop, so that a little clear water had to be added every few days. In the case of the more permeable marbles the

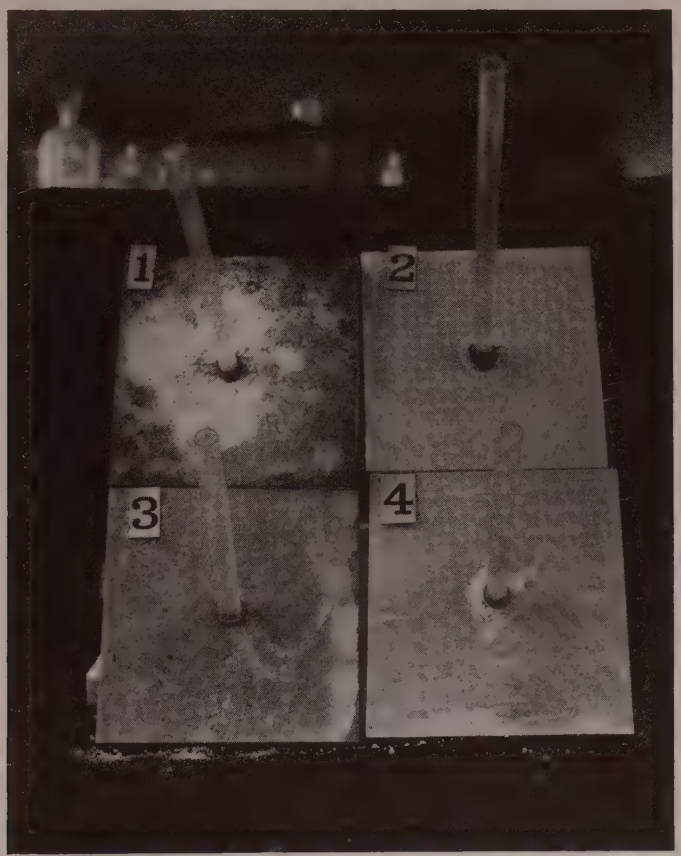


FIGURE 2—Tests with sodium carbonate and sodium bicarbonate.

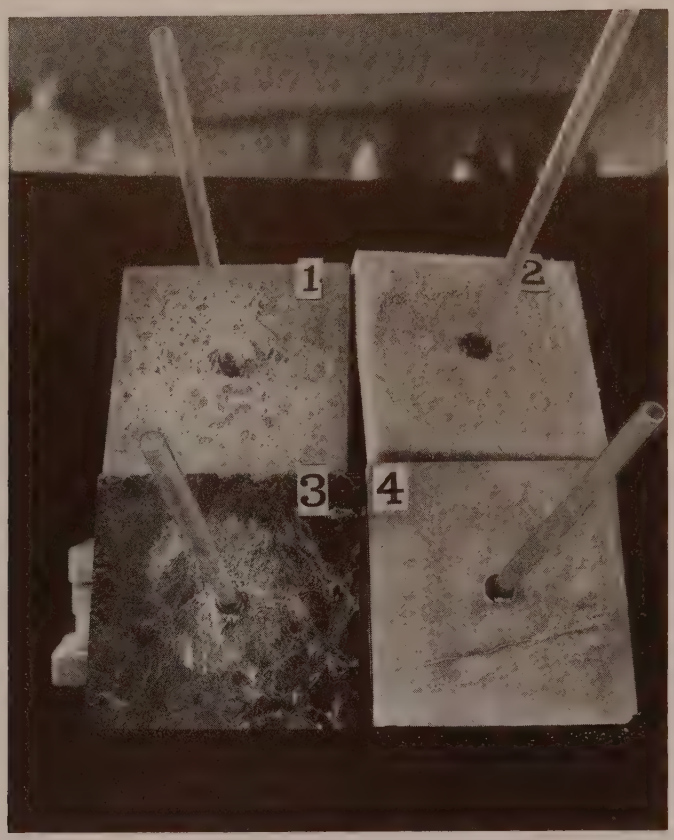


FIGURE 3—Tests with sodium chloride.

salts began to come through in a day or two, while some of the denser ones have shown very little penetration during a period of six months. Figure 1, on page 4, shows a group of tests on several different marbles with a few salt solutions of interest in this connection. Slabs in the foreground marked 1, 3, and 5 are not a part of the test but represent what actually occurred under service conditions. The slabs marked 2 and 4 are a part of the test, having been turned on the side to show the penetration of the salts.

The results of certain tests in this series are of particular interest and are shown more clearly in the following figures: Figure 2, Test Number 1, shows the effect of sodium carbonate (Na_2CO_3) on a rather porous domestic marble. The solution penetrated the slab within a few days, forming a mass of crystals on top. Within a few weeks small pieces of the marble began to flake off. This action has gone on continuously until the entire surface is badly defaced. Test Number 2 in this group is the same salt on a dense, domestic marble of uniform texture. No ill effects have appeared. Test Number 3 illustrates the action of sodium bicarbonate ($NaHCO_3$) on a dense imported marble. Very little of the solution appears to have penetrated through the marble except along a few strain lines where it has wedged loose several small pieces. Test Number 4 exhibits the action of a combination of the last two mentioned salts on a veined variety of domestic marble. The decay is beginning to manifest itself along the vein, which seems to be somewhat more porous than the white portion.

Figure 3 shows tests on four different

marbles with sodium chloride (NaCl). Number 1 exhibits the same wedging action as that in the above tests but confined mainly to the strain lines. Number 2 is the same test on a coarsely crystalline, domestic marble. The solution penetrates readily between the crystals which are outlined by the salt deposit, but no definite disintegration has been noted.

Test Number 3 shows the results of the same test on an imported serpentine. The surface is defaced by blistering and spalling along certain lines of penetration. Test Number 4 shows the action of the salt on a veined marble of generally close texture. Practically all of the decay is along the vein, which appears to be a line of weakness.

Figure 4, Test Number 1, shows the action of magnesium sulphate ($MgSO_4$) on an imported marble. Spalls are rather pronounced along certain crevices or strain lines. Number 2 is a test of sodium sulphate (Na_2SO_4) on a domestic marble. The crystallizing action along a suture joint passing through one corner has split the slab at this point. Number 3 is a test with magnesium sulphate on a verde antique marble. The solution penetrates along certain lines where the crystals force their way through the surface. Number 4 is a test on the same marble with ammonium carbonate, $[(NH_4)_2CO_3]$. The action here is somewhat different from that in the other tests in that numerous small flakes are popping off the surface without showing the crystal growth.

Figure 5 exhibits an appreciable amount

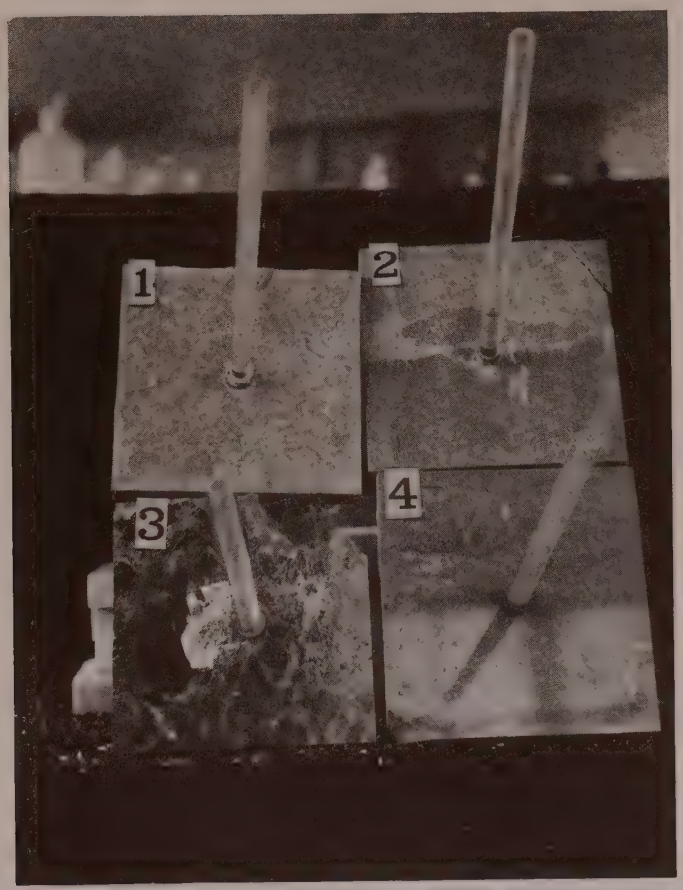


FIGURE 4—Tests with magnesium sulphate, sodium sulphate and ammonium carbonate.

of soluble salt extracted from common brick by a leaching process. The efflorescence matter is mainly sodium sulphate and magnesium sulphate. The action of these materials on marble is shown in Figure 4, Tests 1, 2 and 3.

Figure 6 shows the soluble salts from a brick backing passing through a marble and causing efflorescence on the surface. Small flakes of the marble are being pried off by this action.

These tests indicate that several salts of common use or occurrence exert a slow disintegrating action on marble under certain conditions. Some marbles are much more readily attacked in this way than others, certain ones showing decay within a week or two while others have not shown appreciable signs of decay during six months' exposure to the severe conditions of the test. The density of the marble does not appear to be a dependable criterion for judging the resistance to such conditions, since certain ones of relatively high permeability indicate considerable resistance to the action. In general the tests indicate that those marbles of uniform texture and freedom from strain lines are the most resistant. Especially in the very dense marbles the crystallizing action appears to be confined to the strain lines and veins, and this results in the formation of spalls along such features.

Evidently this is not a chemical action, since the part of the marble directly exposed to the solution of salt does not show decay. The decay occurs only where there is evaporation of the solution after it has passed through the marble, which condition is favorable to the formation of crystals. This theory is also substantiated by the fact that salts of different chemical composition produce about the same action. Further proof lies in the fact that the spalls of marble produced in this manner do not differ in composition from the original material. Apparently there is little difference in the disintegration caused by salt solutions and that produced by frost, since the latter is

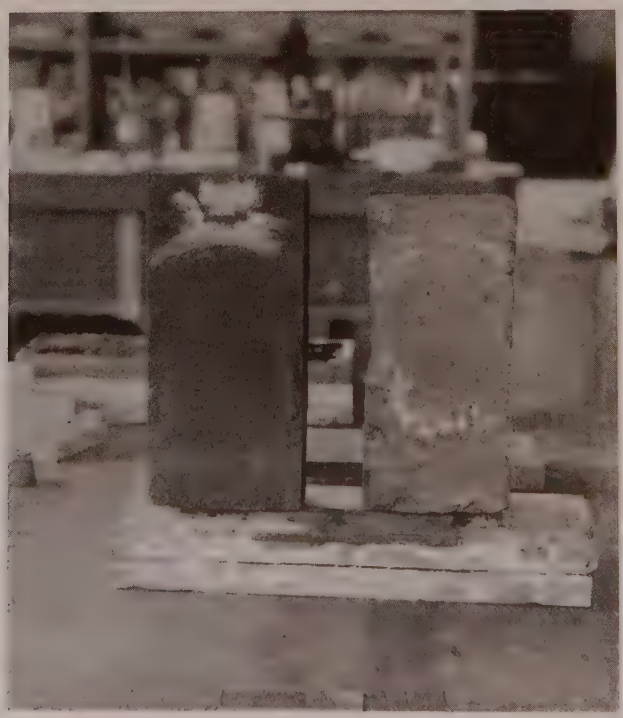


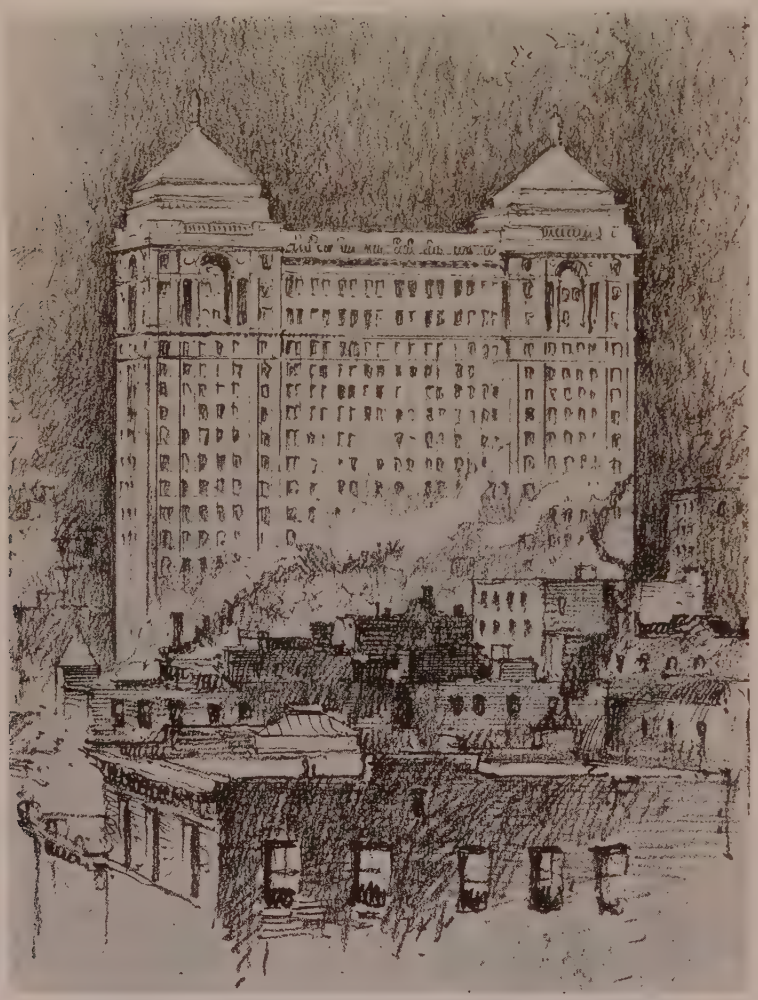
FIGURE 5—Salt leached from bricks.

FIGURE 6—Salt leached from common brick.

due to the wedging action of ice crystals forming in the pores. However, the action of salt crystals can go on continuously where the conditions are favorable, regardless of the temperature, and there is a gradual building up of the crystals, which results in a more rapid decay.

These tests indicate the necessity of avoiding certain conditions in the use of marble if the best service is to be obtained. A satisfactory means of sealing up the pores —*i.e.*, a treatment which will accomplish this and prove to be as durable as the marble itself — would overcome the trouble. The theory held by some that the polishing process accomplishes this, does not appear to be tenable. As a matter of fact, actual measurements of absorption and permeability of polished and unpolished materials do not indicate any appreciable difference. It is possible that some material could be added to the polishing powders which would accomplish this in the regular polishing operation. Such a material would serve not only to overcome the harmful action of salts, but would reduce the tendency of the material to absorb stains. The development of a suitable method for doing this would seem to be a subject worthy of further research.

The susceptibility of marble to attack by salt solutions as pointed out in this article may serve to explain certain cases of trouble under service conditions. In order to avoid conveying the impression that such cases are of common occurrence it may be well to repeat a statement made at the beginning of the article. Troubles of this kind are rare and with proper attention to certain structural details could be greatly reduced. It is probably safe to say that marble, on account of its general uniformity of composition, enjoys as great a freedom from troubles of this nature as any natural or artificial stone.



SYMPHONIES OF STONE IN THE NEW HOME OF THE LIBERTY BANK OF BUFFALO

GOLDEN symphonies in stone pervade the new home of the Liberty Bank of Buffalo. Coming from the treasures quarried in many lands, they are harmonized in this great structure now dominating the skyline of the City of the Lake. Thousands of tons of masonry which entered into this vast structure illustrate that in this age of steel man must depend much upon granite, marble and stone to achieve effects of monumental dignity and classic beauty.

To sense the relationship of quarry to mine and forest in the creation of the Liberty let us first consider the structure in its mass. The building is 232 feet along the line of Court Street and 61 feet in Main and Pearl Streets respectively. Its height from the mean level of the curb to the top of the Statues of Liberty on its towers is 337 feet. Twenty-three stories tall, it contains 4,000-000 cubic feet and approximately 300,000 square feet of floor space. The 3,800 tons of

The ground floor corridors have walls lined with Tavernelle marble; the floor is a combination of Travertine, Levanto and Tavernelle.

steel beams in its skeleton if placed end to end would reach sixteen miles. The glass panes in its 1,600 windows have a total area of 37,500 square feet or nearly an acre. Many hundreds of miles of pipes and wires and channels serve as the nerves and ganglia which co-ordinate the activities carried on within it.

And yet the Liberty Bank, despite its varied equipment, is a miracle in stone. Its thirty-seven caissons rest upon the living rock, 72 feet below the main banking floor, and they are made stable by cement—that ground stone—and by the broken stone and sand, which is itself hard stone reduced by the action of the waves of primeval seas.

The caisson foundation represents 55,000 cubic feet of concrete and the foundation walls 50,000 more; the cinder concrete 100-000 cubic feet and the Schuster slabs 135,000 additional.

The walls of this great fabric, as well as its interior adornment, are composed of masonry of many kinds.

The base of the outer walls is Pink Granite. As Court Street is rather a steep grade, there are stores on the first floor of the structure at one end, while at the other is the entrance to the basement of the bank. Consequently, the granite varies in height, rising to the level of the store fronts at one point and receding at the Pearl Street end. Up to the fourth floor the outer walls are composed of limestone. The balance of the façade is made up of 1,500,000 buff bricks. The cornices are of Fire Flash terra cotta

The main banking room with its walls of Travertine, columns and screen of Tavernelle Claire, and floor of various marbles.

similar to that used in the Pershing Square Building in New York City.

Pedestals in pyramid form surmounting the towers are of limestone also, and upon each of these rests a bronze Statue of Liberty 26 feet in height. The architectural scheme of the building according to the architect, Mr. Alfred C. Bossom, of New York City, is thoroughly American in feeling. The general style is Adam, but so adapted as to make it very strongly akin to the very early types of Colonial.

One of the most interesting features of the building from an architectural point of view is the construction of the twin towers, which are not only American in motive, but may be well described as the very earliest or the Ur-American. The designs for them were developed by the architect from his researches in Mexico made for his book, "An Architectural Pilgrimage to Old Mexico." These pedestals closely resemble the tops of the Mayan pyramids, such as are found in Yucatan and Guatemala, the original model being the great Tikal pyramid. They and their towers convey the idea of proclamation, in the same spirit which the priests of the Mayans followed when calling from the summits of the ancient pyramids to the faithful in the plains. For these pedestals the limestone of soft mellow tones was especially appropriate.

The entrances to the building are surrounded with carved marble and the doors are of American walnut with bronze crestings on the top.

The ground floor corridor is of Tavernelle marble to the ceiling and the floor itself is a combination of Travertine stone and Levanto and Tavernelle. In a niche in the main hall stands a Carrarra Statue of Liberty, the work of the famous sculptor, Mr. Leo Lentelli. It is a smaller replica of the colossal bronze figures on the tower approaches to the main banking room from the corridor, running the entire length of the building, and also from Court Street. The doorway of the bank is of marble elaborately carved.

The color scheme of the main banking room itself is of a rich creamy tone, which accentuates the many beauties of bronze decoration and the warm hues of the ceiling. These days banks offer a friendly atmosphere; the grim formality which too frequently went with dazzling white marbles, or with cold and glistening tiling—beautiful indeed in themselves, but needing in addition the ameliorating influences of softer materials—is rapidly disappearing.

Monumental as this structure is, it is also inviting and attractive in its effect. One is conscious of its cheer and welcome the moment one's foot crosses the threshold. The walls of the room are entirely of Travertine, which is especially appropriate; moreover, the presence of so many large windows would make another type of stone difficult to employ. The huge columns in the banking room rise from the line of cages and screens. They are of fluted Tavernelle Claire surmounted by elaborate plaster caps which have the same creamy tone as that of the room itself. The floor is of rich marbles, its field consisting of Travertine, with a border of Botticino in which are inserts in the form of diamonds, squares, circles and other diametrical designs, of Gray Siena, Moncerati and Struzzini. The effect of the Travertine of the walls and floor is accentuated by the strong blues and deep reds which appear in the ornate, coffered ceiling, which is modeled from a Renaissance design. The warm tone of the Travertine also gives full value to the highly decorative bronze grilles and screens which surround the cages.

As clients enter the banking room, they see straight before them at the Pearl Street

The Safety Deposit Department in the basement has walls of Tavernelle and floors of Tennessee marble.

end a rich and massive composition, in the center of which is a circular clock of Tavernelle marble with a dial 27 inches in diameter surrounded by a shield and carved garlands.

Toward the Main Street end of the banking room is splendid marble work on the inside of the room which surrounds the entrance door. Its pediment and entablature are of Tavernelle, elaborately carved and flanked with rustication channels which give a wainscot effect. On either side of the door, also, are carved panels bearing garlands and fruit.

The officers' space and other quarters are separated from the public space in the banking room by balustrades of Tavernelle marble consisting of beautifully turned balusters interspersed with medallions of panels on which are carved designs, enlarged from ancient Roman coins. This detail suggests that Roman idea of strength and grandeur which appears in so many of the structures in the City of the Seven Hills. Balusters of the same material also appear on the mezzanine floor.

The check desks and other banking furniture rising from the field of Travertine, are of bronze in elaborate patterns. In the Safety Deposit Department in the basement the walls are of Tavernelle marble and the floor is composed of pinkish marble brought from Tennessee. The stairway leading from the center of the main floor into the Safety Deposit Department has a rail of carved Tavernelle in the form of pilasters and of medallions, the design being bound together by life-like forms. All the metalwork in this department is of bronze. Here, too, are coupon booths composed of American Walnut with bases of marble. In the other de-

partments of the bank the Travertine is combined with American woods of fine textture. The foyers to the Directors' Room and to the Library have walls of Travertine with trimmings of American walnut.

The bank itself occupies part of the basement and three floors, the balance of the building being rented out to tenants. Above the banking room the floors are finished in the same perfect style as that which characterizes the parts of the building given to the financial institution. All the corridors in the office part of the structure are lined to the ceiling with Carthage Stone. It gives a sense of solidity and adds to the charm of the long vistas.

Taken all in all, the Liberty Bank, with its solid foundations and its enrichments from the great marble quarries of the world, has every factor which should make it endure through the ages, a monument to man's progress and ingenuity.

Carved marble doorway on mezzanine floor, Liberty Bank of Buffalo. Alfred Blossom, of New York, was the architect.

A quarry of Breccia marble in Canada.

MARBLES OF CANADA

Many Varieties Occur in Various Parts of the Dominion

LARGE deposits of marble suitable for decorative purposes occur in various parts of Canada. However, the amount quarried is comparatively small.

According to Logan's "Geology of Canada," page 823: "The crystalline limestones of the *Laurentian* series of rocks yield white marbles suited for decorative purposes, but not for statuary; they are quarried at Calumet Falls on the Ottawa, Portage du Fort and Felzoy Harbor. Large blocks of pure white are obtained from Elzivar and Marmora, and the statuary marble from Barrie would probably not be inferior to that of Carrara were it not for grains and specks of quartz and tremolite, which detract from its excellence in quality."

According to Ibid: "Colored marbles are obtained from the rocks at the mouth of the Madawaska, in MacNab County, on the Ottawa. The colors are gray and dark gray variegated; it can be raised in large blocks. A rich red variety is also found amongst the Quebec series of strata at St. Joseph on the Chaudiere."

According to Dawson's Academic Geology," page 593: "Marble occurs sparingly in the eastern states of British America, but colored varieties are found amongst the carboniferous limestone strata at Fraser's Mountain and Little Harbor, near New Glasgow; at Plaistow Cave, in County Inverness; and in Long Island, Cape Breton, white marble occurs amongst the metamorphic schists of Five Islands in Nova Scotia, together with colored serpentinous marble."

M-325–375, Annual Report Geological Survey of Canada, 1887–88, says: "Marble of excellent quality for general building and to some extent for ornamental work occurs on Taxada Island. The colors range from gray to white, sometimes handsomely

marked. An outcrop of deep red marble veined with white calcite occurs associated with red shales and sandstones a short distance east of the Colway River, in the Province of Quebec."

According to Merrill: "White, gray, and pinkish varieties are reported from White Cliff Island; gray handsomely variegated from Beaver Cove, on the east coast of Vancouver Island; gray mottled from Nimpish Lake; and a considerable variety from Hone Lake."

At various points in Hastings County, Ontario Province, from the beds of crystalline Lauretian limestone, marbles that vary from white through different shades and variegations to dark brown are quarried for decorative use.

Rocks of Cambrian and carboniferous formations, found in abundance in Nova Scotia, New Brunswick, and on Prince Edward Island, are used for ordinary building stone; but rocks of such texture and quality as to be useful for decorative work have not been found up to the present time.

No decorative stone of consequence has been found on the Interior Plain from Lake Superior to the eastern boundary of the Rocky Mountains. The Intermediate Plain, comprising portions of Quebec and Ontario, is rich in marble deposits, many of which are now being developed.

In British Columbia on the Selkirk Range of Mountains, near the shores of Lake Kootenay, a light gray veined marble known as Kootenay is produced.

At a point between Bancroft and Bronson, Hastings County, South Ontario, and at Phillipsburg and South Stukely, near the north shore of Lake Champlain, in the Province of Quebec, extensive quarrying has been conducted for many years, and the range of colors carry from white through the variegated varieties to almost black. Some are ordinary marbles, others mixed with serpentinous bands and calcite lines or bands, some few are brecciated, while still others are sometimes classed as serpentine.

Labradorite is found in the stone quarries on St. Paul Island, Labrador.

It would seem altogether probable from a review of the reported marble deposits in Canada and a study of what has been produced to date that Canada will, at some time in the future—and at a not very distant date—produce a much larger percentage of the world's supply of marbles than is being produced at this time.

Hauling marble under difficulties in Canada.

KANSAS MEMORIAL TO THE G. A. R.

Built With Money Collected From the Federal Government on Civil War Claims

AT ten o'clock on the morning of September 27, 1911, in Topeka, Kansas, President Taft, trowel in hand, was spreading mortar on a new foundation preparatory to setting the corner stone of a building destined to be one of the country's exceptional memorial halls. It was entirely fitting that no less a personage than the President of the United States should have the privilege of performing this act. By this preliminary formality which put under way the construction of the Memorial Building at Topeka, the President commenced the home of an institution which today preserves and publishes the exciting story of a state whose development has been directly responsible for some of the outstanding events in our national history. As a direct consequence of the struggle for the organization of Kansas Territory came the repeal of the Missouri Compromise, the formation of the Republican Party and the precipitation of the Civil War, resulting in the overthrow of slavery. Many are the momentous questions whose settlement has made history for this progressive state. It is all carefully preserved by the Kansas State Historical Society.

The Society was founded in 1875. It has grown rapidly and ranks as the second in size in America. It possesses many valuable historical manuscripts. Among them are the books containing the transactions of the old fur companies and the letters of that successful Indian agent for the Western Tribes, Governor William Clark. The McCoy manuscripts alone make forty bound volumes telling of the hardships and ambitions of the pioneering people who settled Kansas, Oklahoma, Missouri and other neighboring states. The great political questions of the country, including the many sidelights thrown upon them by succeeding years, are treated in volumes whose pages reflect the most careful thought and exacting labor.

All of these valuable documents, besides thousands of other works and collections, are safely deposited in the comparatively new home of the Society, the G. A. R. Memorial Hall, at Topeka. Instead of raising money by the usual means of popular subscription or general drives, this building has the distinction of having been funded by circumstances arising out of historical events connected with the state. The State of Kansas had claims against the Federal Government resulting from the Civil War which amounted to over $500,000. These claims were not collected until 1909, when enough was appropriated to purchase the building site. This was done in 1911. That year another appropriation was made, large enough to take care of the general contracts, not including the interior finish or furnishings. Ground was broken on July 6 and the foundation was started. Not long afterward, the first carload of marble arrived, and straightway began the erection of the Memorial Hall as designed by Mr. Charles Chandler. Two years later came an additional appropriation to provide for the interior finish.

The exterior is compactly built of Vermont Imperial marble. This material has brought an added attractiveness to the beautiful lines of the classic Renaissance design. Each piece, whether plain or carved, has found its rightful place in perpetuating the story for which the Memorial stands. The splendid façades radiate that softness of light which is characteristic of the translucent property of marble. The calm stateliness of the building gives no hint of the many fiery scenes of American history which once centered around this particular territory. Its graceful lines reflect only prosperity and contentment. Yet within those shining walls are sheltered countless pages dealing with the bitterly intense moments of our country's history. There are quantities of original manuscripts from which students and historians gain first-hand knowledge of the ideals and aspirations of the Kansas pioneers, the men who moulded a state in the midst of turmoil and strife.

The front elevation presents a fine architectural thought. The main entrance occupies the section between the wings. At the top of the wide steps two massive square pillars divide the opening into virtually three small entrances, each with its own set of doors leading into the lobby on the main floor. Minutely carved emblems in Rutland White marble are placed above each opening. In this middle section the two upper stories are set back, making room for a large loggia over the main entrance. Supporting the entablature of this loggia are six fluted monolithic columns of marble topped by perfectly cut Corinthian caps. From this walk of marble columns one may enter the library or the foyer of the second floor. Connecting the bases of these columns is a balustrade which corresponds to a similar one above the entablature of the building at this point. The central portion of the upper balustrade con-

tains carved pieces representing wreaths in relief. The whole is surmounted by a large marble globe, forming a satisfactory apex to a wholly pleasing design.

So pleasing is the external appearance of this building, that one feels confident of finding in the interior collections of art, science, and literature as far removed from the ordinary as the building itself. And there is no disappointment. From the art collection in the foyer of the main floor, up through the library with its priceless volumes, to the museum in the main gallery which contains the famous Goss Collection of birds, students of any subject will find amply inspiring material and generous information.

Nothing could be more appropriate than this beautiful edifice to commemorate the memory of the men who fought to preserve the ideals of their great country. Its marble walls guarantee many generations of usefulness to those who seek knowledge at its shelves. Such memorials are sources of inspiration to any who look upon them. They serve to instill in the hearts of those who follow the deepest reverence for the deeds of departed heroes whose struggles made possible the unassailable unity of our country.

The main entrance, G.A.R. Building, Topeka, Kansas.
Mr. Charles Chandler was the architect.

Another Use For Marble In The Home

Unsanitary conditions in the kitchen are more dangerous—and therefore more inexcusable—than anywhere else in the house.

Marble insures cleanliness; it is germproof, practically stainless and easy to clean. Besides, it adds luxury, dignity and beauty to the room —at a very moderate cost.

St. Etienne du Mont, at Paris, in which classic and Gothic features appear in nearly equal proportions.

FRENCH CHURCH ARCHITECTURE AT THE TIME OF FRANCIS I.

CHURCH architecture did not, for very cogent reasons, receive as much attention in France during the reign of Francis I as did that of the palaces and chateaux. Political unrest, the ambitions of the court to emulate the splendid secular buildings of Italy, and the gradual diminution of the Church's power, were responsible for the cessation of that wave of religious construction that was the chief feature of the Gothic period that preceded.

Naturally, too, ecclesiastical work was not as advanced in style as secular, and clung far more tenaciously to Gothic principles. With it, Renaissance influence took the form of a translation of the individual numbers. The church builder, of course, was face to face with the same problem of

Illustrations courtesy Thomas Machen, architect, Baltimore.

draping a mediaeval body with Renaissance clothes, but whereas in the castle its very reason for existence—to serve as a stronghold, a fortified home—was becoming obsolete, in the church its purpose remained unaltered. No change in its essentials was permitted; the plan, with its systems of rib-vaulting, flying buttresses and even the pointed arch and general verticality, persisted throughout the sixteenth and eighteenth century construction.

The year 1520 marks about the earliest time that one may find Renaissance forms appearing in the religious structures of France. The remodelling of St. Eustache, one of the most fashionable churches in the capital, began in 1532 and continued slowly for the next fifty years. From about 1590 to 1624 the work was discontinued, but was resumed again in 1625. By the middle of the seventeenth century the church was complete with the exception of the upper part of the west façade. Probably no other church serves so well as an example of the changing aspects of church design.

There has been some disagreement among authorities as to whether the plans for St. Eustache were the product of several generations of the Mercier family, or whether, as seems more likely, the design was conceived by Dominic of Cortona, known in France as "Boccador," who came to France with the colony of Charles VIII in 1495.

Certainly the character of the design is strongly reminiscent of the Loire chateaux, and we know that Cortona, the architect of the Blois, Chambord and the Paris Hotel de Ville, had acquired an intimate knowledge of French practices, during the course of thirty-six years of active participation in the projects of Francis I. Furthermore, it was wholly natural that the King's interest in all architectural matters should have drawn him and his favorite designer into the affairs of St. Eustache, and that the drawings were worked out with surprising completeness is

St. Eustache, in Paris, illustrates the changing aspect of church design in France during the sixteenth century.

Doorway in the chapel of the Château of Amboise, showing the effect of the new movement in the decorations and shape of the arches.

attested by the fact that the portions built in the seventeenth century can hardly be distinguished from the earlier parts and bear practically no trace of contemporary influences.

The dimensions of St. Eustache are comparable with those of Notre Dame, differing from its more famous sister only in total length and the height of the aisles. The internal length is close to 300 feet, and the height of the nave is over 100 feet. The transepts are 140 feet wide, the aisles about 60 feet high, with square bays measuring about 20 feet from center to center. There are three bays in the choir and five in the nave, and in this particular, in addition to the differences in dimensions already noted, lie the chief deviations in plan from Notre Dame. The lofty outer and inner aisles of equal height, with the high nave arcade and aisle vaults, give a freedom of vista that one is more apt to see in the Gothic churches of Italy.

It is apparent from the foregoing that St. Eustache does not show any radical departure in principle from the structural system of the era that preceded the time of Francis I. The characteristic differences are found in the forms of detail, ornament and feature. "Ogee curves," wrote W. H. Ward, "and various geometrical schemes were introduced, including star patterns, which were particularly affected at the crossing. Each part of the vault was decorated in various ways. Ribs received Renaissance sections and enrichments. Cells were carved, bosses decorated with crowns or wreaths, or else a panel was substituted for them. Pendents hung from a meeting of ribs, connected to the vault by flying ribs, cuspings and scrolls, and terminating in inverted 'tempietti,' 'culs-de-lampe' and foliage work.

"The multiplication of ribs tended to leave intervals so small that a single stone would fill them, whence there arose in Normandy a type of rib-and-slab ceilings, which reached its richest development in the chevet chapels of St. Pierre, Caen, and at La Ferte Bernard. The rib system of a more or less complicated vault was used in skeleton (with the spandrils filled either with slabs or with tracery), upon which another and nearly horizontal framework of ribs reposes, whose spaces are each filled in with a slab. Every part is enriched with scrollwork and carving, and pendents hang like stalactites from each intersection."

True barrel vaults do not occur in France until the last half of the reign of Francis I, though there may be found, as at St. Martin and Tours, certain forms that have all the constructional features of barrel vaults, but retain the non-functional ribs. Semi-domes over apses are also seen, as at St. Saturnin and at Sens, but dome construction on a large scale was not attempted. The jointed arch gradually was supplanted by the semi-circular or flattened arch, and even where used, the keyblock is frequently found camouflaging the point.

Roofs continued to be built high, ending on the west and on the transept fronts in elaborate gables, and hipped at the east end. Towers were erected at the intersection, as at St. Jean at Caen, and frequently a timber flèche was used, as at St. Eustache. The eaves cornice frequently had a balustrade composed of statuettes, openwork inscriptions or, as at St. Pierre at Caen, of fanciful figures, cherubs and vases.

The disappearance of the church spire was a marked feature of the period. Its place was usually taken by the cupola lantern, such as is seen on the towers of Tours Cathedral. Very fine examples are those on the Cathedral at Blois, and at Bressuire, St. Pierre, Argentan, Coutances and that of St. Antoine at Loches. The Bressuire spire is

West front of the church of
St. Pierre at Caen.

exceptionally impressive in design, beside being thoroughly French in its lines, with the buttresses so arranged that there is a satisfying recession as the eye mounts upward. The work at St. Antoine has an open lantern and vertical panelled sides, resembling the campanile of some Italian edifice. The bold buttresses, angle turrets and heavy silhouettes of the mediæval towers are retained in most of the church structures, though some attempt was made to change the plan and enrich the faces and angles with canopy work or other Renaissance detail. At the top were all sorts of statues, balls, vases, miniature domes, minarets and what not, with an occasional flat cornice.

Doors and doorways were inclined to be much more elaborate, and as they are the most arresting features of a façade, this tendency is the more striking.

At first, the receding soffit and jambs were decorated with niches, figures, small columns and pilasters as at Tonnerre, L'Isle Adam and at Notre Dame, Guingamp. Later a coffered splay was used instead of the concentric orders in the soffit, as evidenced at Dijon and Gisors. Then followed the practice of using classical elements and enclosing the whole portal in a framework almost independent of the rest of the design. Finally, this frame became the dominating element, with the arched opening itself of relatively minor importance. The various stages of development are seen in the doorways of St. Martin at Epernay, St. Eustache at Paris and St. André-lez-Troyes.

Capitals showed to a greater extent than did the bases the influence of the Renaissance spirit, though it was naturally a dif-

South side and east end of St. Pierre at Caen.
The chevet chapels are luxuriant
in Francis I work.

Detail of the doorway to the Church of Saint Wulfran at Abbeville, showing early Renaissance influences.

ficult problem to harmonize the vaulting ribs of the Gothic type with a classical entablature. One example may be cited of a fairly satisfactory solution: at St. Taurin, in Evreux, the wall shaft was broadened by corbelling, so that the junction of pier and vaults is at least logical.

Before passing on to the style of Henry II, it is worth while noting the features of certain churches in France that typify the period. Notre Dame at Tonnerre had a west front added in 1536; a few years later this was damaged by fire, but we can still perceive that the composition, with its spiral-turreted tower and boldly recessed door, was of unusual beauty. The latter had above it a gallery and an elaborate gable, treated in pure early Renaissance manner.

The doorway in the south transept of St. Pierre, also at Tonnerre, shows even more of the style tendencies of the time; the church itself is most interesting, being a repository of Renaissance fittings of all kinds and phases. Most of it is Flamboyant though there are indications of later styles in certain parts.

At Troyes, the churches of St. André-lez-Troyes, St. Nicholas and St. Pantaléon all exhibit in their structure and fittings evidence of the changes of style experienced during the sixteenth century.

At Pontoise, St. Maclou, though originally begun in the twelfth century, is mostly fifteenth century. However, in 1524 was begun the erection of a double aisle and chapels on the north side; about the same time the nave and northwest crossing-pier were rebuilt. Later, the south side received the addition of a single aisle and chapels with east and west doorways.

St. Remy and St. Jacques at Dieppe, St. Pierre at Dreux and the Cathedral and St. Taurin at Evreux all exhibit much Renaissance work, as do several churches at Caen. At Gisors, St. Gervais and St. Protais show

Renaissance flèche on the roof of the chapel to the Château Chenonçeaux.

specimens of all the various stages of architectural development peculiar to the sixteenth century in France.

Of the tombs that were built during the time of Francis I, the monument to the Cardinals of Amboise in the Lady Chapel at Rouen Cathedral is perhaps the most splendid expression of artistic achievement. The base is alabaster, as are also the background and canopy, all lavishly decorated with a wealth of statuary in bas-relief, and the most elaborate carving of scrollwork, candelabra and emblems. Upon a black marble slab are two larger effigies, kneeling in flowing garments of amazing naturalness. The figures represent the two Georges, the original Cardinal and the George who built the monument. The work is attributed to Rouland le Roux; it was built in 1520, and altered in 1540 by increasing the length of the marble slab to make room for the second effigy.

Church fittings, accessories and, especially, the stained glass windows exhibit a degree of excellence and originality beyond the general level of the architecture. The Italian influence was mainly confined to the character of the decorations.

The Cathedral at Evreux. The interior is rich in Renaissance.

550 Seventh Avenue. The interior contains much fine marble.

THREE NEW YORK OFFICE BUILDINGS

Higher Rents Made Possible by the Use of Marble

TO render a building intended for purely business purposes pleasing to the eye, especially when it must be, by the limitations of space, narrow and tall, is a problem which has been especially faced by the American architect.

As a result of this problem we have developed the skyscraper, which has satisfied the demand for well-lighted offices and the concentration of similar classes of business within small areas.

An even later development is the tendency to modify the purely practical style of office-building construction by the addition of certain decorative features. Strangely enough, it has been found that such buildings attract

the supposedly hard-headed business man in a way that redounds to the financial benefit of the owners.

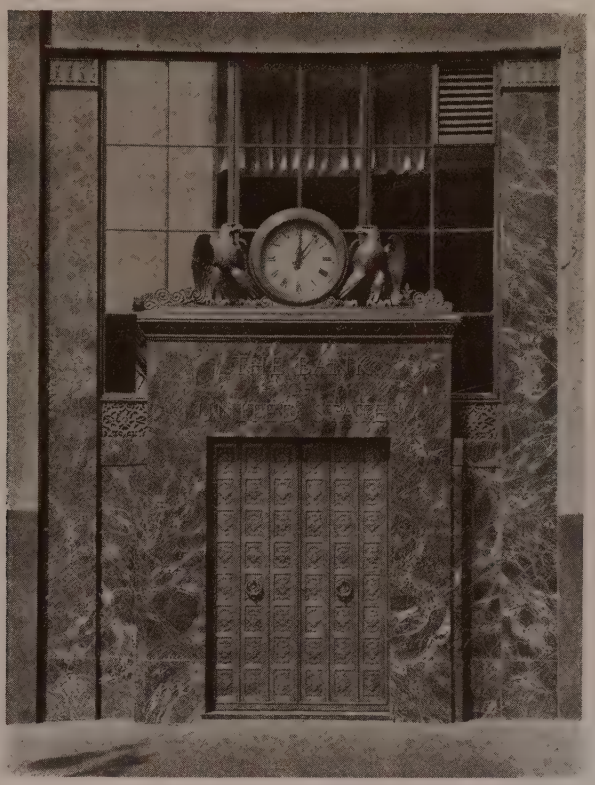
Buchman and Kahn, architects of New York, have designed three buildings in that city that strikingly illustrate the practical value of beauty in such structures. The first of these is the Arsenal Building, at 35th Street and Seventh Avenue. The Arsenal during the Draft riots of the Civil War was the center of great trouble and stood at the corner as an old landmark for generations until removed two years ago to make room for the Arsenal Building. This structure has been planned to meet certain requirements of the garment industry, particularly for concerns requiring large areas, and is equipped with package chutes, express and local passenger elevators, fast freight elevators, and all of the other facilities that the most modern commercial buildings can provide. It is interesting to note from the point of view of materials and design that the decorative features were studied by sculptors and painters who succeeded in giving the building a certain quality which is not usual in a commercial building. The use of marble mosaic, as well as a considerable use of marble for floors and walls, has lent a great deal of dignity to a purely utilitarian entrance.

The second one of Buchman and Kahn's

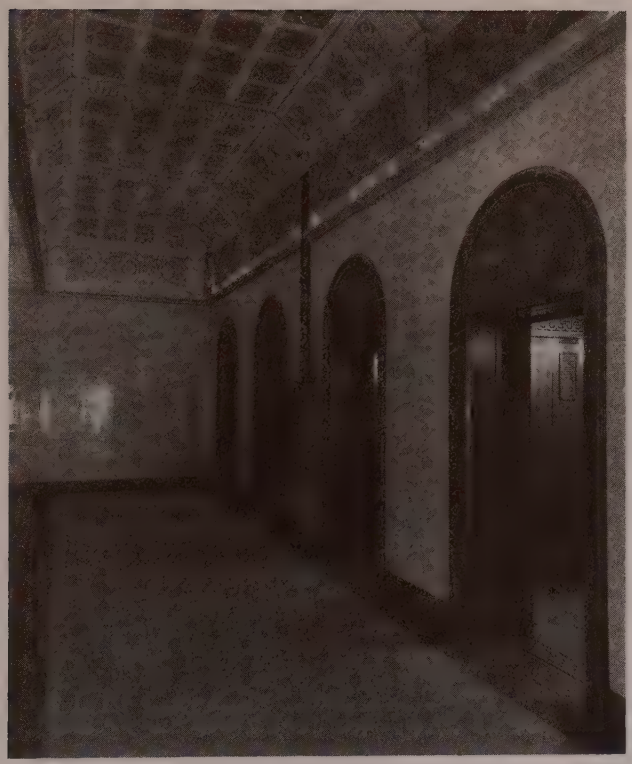
The entrance hall of the Arsenal Building, New York. The floors are Pink Tennessee, with Levanto borders. The walls are Botticino.

Levanto marble in the building at 550 Seventh Avenue.

Botticino walls and Levanto base in the building at 550 Seventh Avenue.



Scientific American Building. The marbles are Rosatta, Botticino, Levanto and Tennessee.



550 Seventh Avenue. Botticino walls; Levanto around elevator openings; Tennessee floors.

creations is at 550 Seventh Avenue. It is the center of a group of dress manufacturers who have maintained such a high standard in this building that it is now a matter of actual financial value to be known as a member of this group. As a result, the rentals of these floors has been placed at a considerably higher figure than they normally would be. The details of this building were also carefully worked out by various craftsmen of genius. For example, the exterior details were modelled in the studio of Maxfield Keck; the entrance hall, which is executed in various marbles, including Pink Tennessee floors, Levanto borders, Botticino walls, and with the elevator openings framed in Levanto marble, is a harmony of color and texture; the bronze doors to the elevators were modelled by Gaston Lachaise, who also executed the mail box. It is interesting to note in connection with this building that the site was originally that of St. Chrysostom's Chapel which was a part of the Trinity Church Corporation. The very particular restrictions of the church corporation were apparent in connection with the design of this structure, inasmuch as matters of arrangement and design had first to be approved by the corporation and the entire progress of the execution was under their control.

The building at 24 West 40th Street has recently become the home of *The Scientific American*. Facing Bryant Park, it enjoys unusual lighting advantages, which is further emphasized by the low buildings adjoining, which will in all likelihood retain their present height. The entrance vestibule is designed with the free use of marble, a combination of Rosatta, Botticino and Levanto marble being employed. The floor in this instance is Pink Tennessee. The building is destined to be the home of the publishing and decorative trades which are forming a center about the Bryant Park district.

In all of these buildings the theory has been most clearly defined that artistic quality can be obtained without prejudice to the commercial value of the structure, and it is interesting to note that these structures have been unusually successful as commercial enterprises.

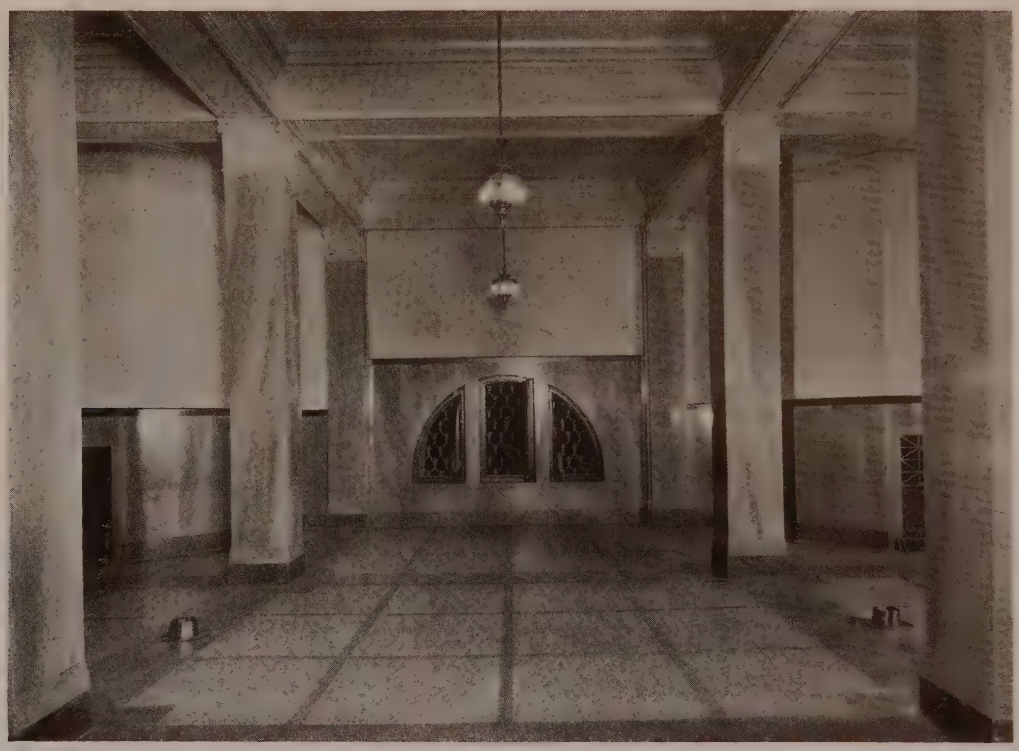
Another view of the elevator lobby, Arsenal Building, New York.

MEMPHIS BUILDING ACTIVITIES

The Criminal Courts and Jail is One of its Notable New Structures

MEMPHIS, during the past three or four years, has seen the completion of a number of very notable building projects which have added materially to the wealth and prestige of the city. The end of the war period found this southern metropolis, as it found practically every other progressive city in the country, about four years behind in residential building. With 1921 came a revival of activities, and in addition to the erection of thousands of homes, there were constructed a large number of handsome, modern apartments. The former prejudice of Memphians against this metropolitan manner of living had been overcome to a considerable extent by the exigencies of the war years.

But the building progress of Memphis did not stop there. Increased facilities for educational work were provided by a school-building program that called for the expenditure in 1923 alone of about $425,000, resulting in four new schools and additions to six others. The year 1924 saw the beginning of the North Side High School. The list of commercial structures includes the Claridge, Parkview and Peabody hotels; the Ford Motor Assembly plant; the Columbian Mutual Building, with a height that would now be illegal under the present building



The first floor of the Criminal Courts and Jail Building, showing the marble columns and wainscoting.

height limitation ordinance; the Security Building Corporation Building, which has been acquired by the Union and Planters Bank and Trust Company; the Lowenstein and the Cotton Exchange buildings; the Methodist Hospital, the Municipal Auditorium and the County Market House. Even the public utilities planned ambitious development programs, and have been carrying them out. The new works for the underground water supply were put in regular operation in 1924; extensive additions were made, too, by the Power and Light Company, the Street Railway system and the Cumberland Telephone and Telegraph Company.

Notable among the buildings of Memphis is the Criminal Courts and Jail, finished recently. The site, a plot of ground 150 by 600 feet, was chosen on account of its proximity to the Civil Courts and County offices, which are located in the Shelby County Court House, directly across the street to the south.

The police headquarters of the city are diagonally opposite, the three buildings forming a group which, in their general architectural appearance, are sufficiently alike to present a harmony of design. The cost of the Criminal Courts and Jail was about $700,000 exclusive of the land, and this amount was provided by a bond issue and expended under the Shelby County Jail Commission, of which Mr. J. A. Riechman was chairman.

The architects, Jones and Furbinger, of Memphis, have used the Italian Renaissance for the exterior, which is of limestone. The heavy scrolls at each end of the building, somewhat like those on the church of Santa Maria della Salute, in Venice, are typically Baroque, and serve most effectively to offset the setback of the three upper floors as viewed from the sides. The

main entrance, with its massive round-arched doorway and its ornaments to either side at the second floor level, is strikingly reminiscent of some of the Florentine palaces.

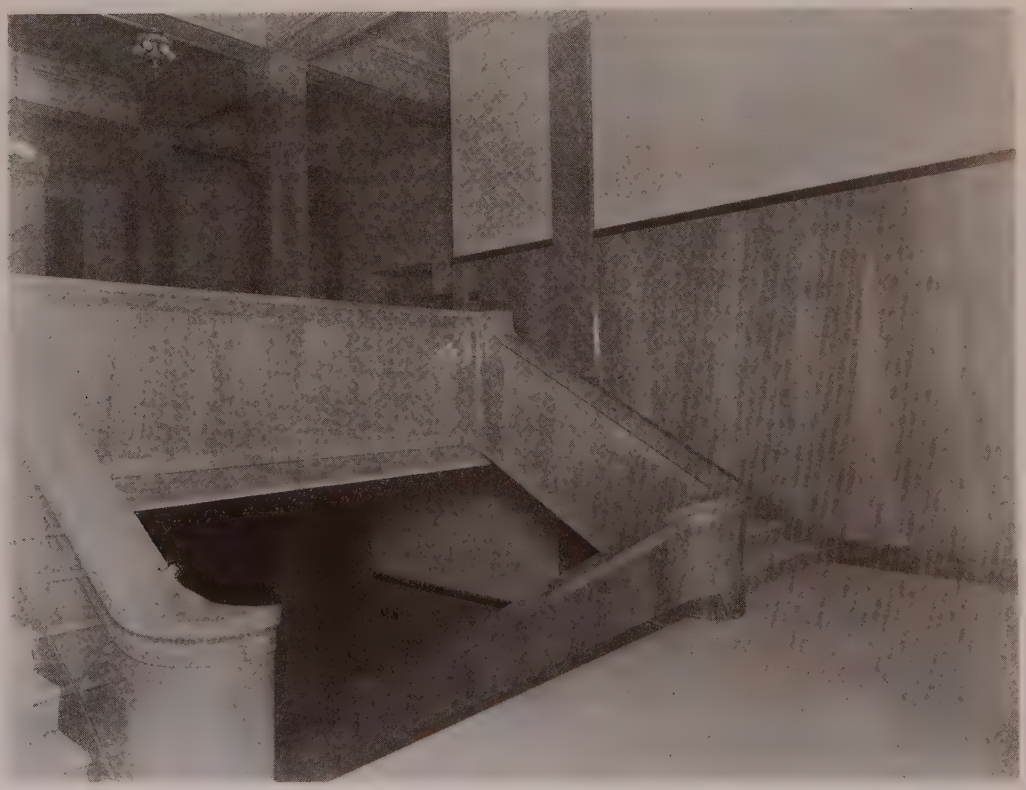
The entranceway leads directly to a large lobby opening upon a rotunda in the center of the building. From this rotunda corridors lead in every direction to the jury dormitories, the laundry and other rooms on the one side; and to the sheriff's offices, reception rooms and kitchen in the opposite wing. A main stairway from the rotunda leads to the second floor. There is also provided a means of access to the jail from the rotunda, though the principal entrance to the jail is through the courtyard, the latter being closed by a high wall, with openings at each end for ingress and egress.

The second floor contains the first and second division of the Criminal Courts, offices for the Attorney-General and his

View of the main stairway, constructed entirely of Tennessee marble.

assistants, Grand Jury rooms, offices for the Criminal Court Clerk and his assistants, and private offices for the judges and witness rooms. The walls of the rotunda on both the first and second floor are lined with Pink Tennessee marble to a height of about 8 feet, with bases of dark Cedar Tennessee marble, the balance of the wall being of Caen stone with ornamental plaster cornices. The main stairway is entirely constructed of Tennessee marble, as shown in the Illustration on page 37, while the floors on the first and second floor are of marble terrazzo. The toilet rooms on the first and second floors for both sexes, white and colored, are lined to a height of about 8 feet with Tennessee marble with all the divisions and partitions constructed of the same material.

The Jail proper, which is reached by stairway and elevator, is housed in the three upper stories of the building and is entirely disconnected from the rest of the building except for the passageways leading to the Criminal Court room. The openings into these corridors are protected by heavy steel doors. All the steelwork of the outside windows and the fronts of the cells themselves are made of tool-proof steel. Each cell is equipped to accommodate two prisoners and contains, besides the two bunks, a toilet and lavatory, while each tier of thirteen cells has in addition two shower baths. Marble has found its place in these portions, too. The Jail will have a total capacity when completed of 300 prisoners. All the cells, the kitchen and the toilets are ventilated by a system of forced air which is exhausted through an opening in the attic. The entire building is complete in its furnishings and equipment, and contains the most modern mechanical and safety appliances for housing the inmates.



Details of stairway in Memphis Criminal Courts and Jail Building. The marble is Pink Tennessee with Dark Cedar Tennessee base.

A LIST OF THE WORLD'S MARBLES

By J. J. McCLYMONT

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

GROUP A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

GROUP B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

GROUP C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

GROUP D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

Paygio

One of the Italian quarries.

Peach Blossom—See Fior di Persica and Fleur de Pecher.

Pech-Cardaillac (*Serpentine*).

Quarried near Pech-Cardaillac, Lot, France.

Varied shades of dark green from olive to almost black. (Blagrove.)

Pecorella Alabastros

Pullen gives the following list and description of Pecorella Alabastros but does not give the location of the quarries; all are presumably ancient Alabaster:

Pecorella Alabastro A Rosso

Bands of rosy transparent white, mixed with fleecy mottlings.

Pecorella Alabastro Carnino

Flesh color.

Pecorella Alabastro Dorato

Flushed pinkish-white, patched with lichen of dark red, slightly tinged with gold.

Pecorella Alabastro Listato

Disposition to parallel lines.

Pecorella Alabastro Minuto

Fleshy mottlings very fine and even.

Pecorella Alabastro Minuto Nuvolato

Clouded fleece, small in texture.

Pecorella Alabastro Pallido

Pale fleecy markings.

Pecorella Alabastro Sanguigno

Flesh of blood red.

Pedra Furada Quarries—See Encarnado.

Pedrara Onyx (Takes its name from the old La Pedrara Quarry in Mexico.)

This Onyx is quarried in Mexican territory, but on the peninsula of lower or Baja California, some ten to fifteen miles from the gulf coast and some 150 miles south of San Diego.

Pearl white, delicate rose tints and light

greens are the usual colors. All more or less veined with rose red.

Peerless Antique Buff (Limestone).

Quarried near Bedford, Indiana.
Creamy yellow or light buff, streaked with orange markings.

Peerless Gray

Andres Quarry, Kizer, Blount County, Tennessee.
Gray (not bluish steel gray) with crow-feet of average width.
Takes high polish.

Pegmatite or Graphic Granite

According to Geo. P. Merrill, "This is a granite rock consisting mainly of quartz and orthoclase, but in which the constituents instead of crystallizing in the usual granular condition are in the form of long parallel and imperfect prisms."

Pelitomorphic

Having clay or mud form. Applied to a rock of clay-like texture.

Peloponnesus—See Doliana Black.

Peliviere—See Rose De La Peliviere.

Pellegrino Onyx

From Mount Pellegrino, Corsica.
White with yellow and red veins.

Peloponnesus

Doliana Black and Rosso Antico are sometimes known as Peloponnesus marble.

Pembroke

Carew Newton Quarries, Pembrokeshire, Wales.
Blue gray, with white fossil markings; some varieties show white veins.

Penarth Alabaster—See Alabaster, Welsh.

Penache

Same as Gris Penache.

Pendant (Breche)

Quarried near Pendant, Lot, France.
Gray with red veins. (Blagrove.)

Pengersick Quarries—See Cornish Serpentine.

Peninsula Onyx

Same as Pedara Onyx.

Penmon or Penmon Priory

Penmon Quarries, Anglesey, Wales.
Light brown, with veining and clouds of darker shade.
Takes a good polish.

Penna White

West Grove Quarries, Chester County, Pennsylvania.
Dull white, somewhat coarse texture.

Penne St. Martine (Breche)

Quarried at St. Beat in the Upper Garonne, France.
Combination of white, yellow and gray. (Blagrove.)

Penn Green—See Sylvan Green.

Pennsylvania Marble—See Penna White and Sylvan Green.

Pentelic Marble or Pentelican or Pentelikon, or Marmor Pentelicum.

Quarried from Pentelikon Mountain, near Kakkinaras, about eight miles northeast of Athens, Attica, Greece.

According to Watson the upper portion of the mountain is composed of blue-gray marble known as Blue Pentelikon. Underlying this are layers of mica shale, and below this again are beds of a white marble which is nearly pure carbonate of lime and is known to the sculptors of Greece as statuary marble. Occasionally a few barely visible veins of talc cause a faint tinge of green for which reason Belli calls this marble Cippolino.

Penteli Monastery — See Pentelic White Statuary.

Quarried near the Penteli Monastery, from which it takes its name.

Pentelic White Statuary

Quarried near the Monastery of Penteli on the south slope of Pentelikon.

White when quarried but turns to a mellow light golden tint when exposed to the atmosphere.

Known as Patina.

Pentelic White Statuary or Northern Pentelic, or Dionysos Pentelic.

Quarried at Dionysos, on the northern side of Pentelikon.

Is similar to the Monastery variety, somewhat coarser, more fully crystallized and perhaps a little transparent. (Watson.) See Blue Pentelic and White Pentelic.

Pentelikon

Same as Pentelic.

Pentelikon Blue

Same as Blue Pentelic.

Pentreath Beach

The Holestrow Quarries (see Cornish Serpentine) are above Pentreath Beach.

Peperino or Lapis Albanus

Quarries at Gabi and near the Gate of Albano Laziale and the Castle of Marino. According to Pullen: "This stone is a confused mass of ashes, gravel, and volcanic stones, closely welded together, and is used for stairs and fountains, because it grows more consistent by being wetted. It suffers both from frost and heat and is only found in really good preservation underground. Dark greenish-gray, studded with black fragments like peppercorns, whence its name, or grayish-brown with black spots."

Perak Veined or Veined Perak

Quarried near Ipoh, Perak, Malay States. Dull white with dark gray veins.

Perak White

Quarried near Ipoh, Perak, Malay States. Varies in color. Some are rather coarse, pure white, crystalline, while others are dull white with dark gray veins. (Watson.)

Perfido Serpentine or Serpentino

Same as Green Porphyry.

Peridotite—See Polyfant Stone.

Perigueux

Quarried near Perigueux, Dordogne, France.
Pale bluish-gray varied with shades of green and red. (Blagrove.)

Perla

Light.

Perlaceo Alabastro

Same as Alabastro Perlaceo.

Perlato—See Bigio Antico Perlato.

Perlonjour—See Petit Granit.

Perm—See Russian Malachite.

Pero Pinheiro—See Abancado Das Lameiras, Almiscado Amerello, Almiscado Escuro, Encanado, Lios, Vidraco.

Perricara

Quarried at Perricara, Tournon, Lot-et-Garonne, France.
Pale yellow with red and brown veins. (Blagrove.)

Persecchino Grande

One of the ancient marbles from an unknown quarry.
White with lilac and videt colored spots, some of which are a foot wide.

Persecchino Piccolo

Probably from same quarry as Persecchino Grande.
Is the same as the above marble except that the spots are smaller and some rare varieties have rose colored spots. (Blagrove.)

Perthshire Serpentine

Same as Killin Serpentine.

Peschagnard

Quarried in Isere, France.
Mottled gray, black and white. (Blagrove.)

Pescina—See Parmazo.

Peshawar District—See Nowshera.

Petali Liman

Is a small bay on the northwest coast of the Island Marmora, near which the Marmora statuary is quarried.

Peterhead Granite

Quarried at Stirling Hill, Peterhead, Aberdeenshire, Scotland.
Deep red with dark brown almost black markings.

Petit-Antique

This ancient marble from an unknown quarry has a blackish background with white and gray veins running nearly parallel. (Blagrove.)

Petit Antique

Quarried at Brabancon, Hainault, Belgium.
Black with irregular gray and white spots and veins fairly distributed. (Blagrove.)

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A view of a stairway and one of the corridors in the High School Building, West Philadelphia, Pa.
The treads, wainscot and trim are of Vermont marble.
J. Horace Cook, Architect.

THROVGH THE AGES

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VOL. 3 MARCH, 1926 NO. 11

CLEANING MATERIALS FOR MARBLE

A Study of the Results Obtained With Preparations of the Scouring Type

By D. W. KESSLER

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THE trade preparations used for cleaning interior marblework fall logically into two groups: First, those which contain an abrasive or scouring ingredient; and second, those entirely free from scouring agents. The first group is intended mainly for use on floors and unpolished marblework, while the second group is employed for cleaning both polished and unpolished marble.

The question frequently arises as to what cleaning material is most satisfactory or safest for use on fine marble installations. This point is often raised by owners of new buildings who desire to pursue the right methods from the beginning, or by those who have experienced unsatisfactory results from the use of certain cleaning materials. Instances of valuable and beautiful marble installations gradually losing their distinctive features are frequent and instances of discoloration or other troubles are not uncommon. Believing that with intelligent care and proper cleaning methods, marble interior work can be maintained indefinitely in its original state, the National Association of Marble Dealers has initiated an extensive program for research at the U. S. Bureau of Standards, one purpose of which is to determine safe methods and materials for use in this connection. The research work, while far from complete, has progressed sufficiently to develop certain points of interest. Since starting this work the Bureau of Standards has received numerous inquiries for information along this line which, in the absence of published reports, were impossible to answer adequately by correspondence. The purpose of this article is to present certain results obtained to date in connection with the study of cleaning preparations of the scouring type.

The points of main interest in connection with the use of any cleaning material are: First, do any of the ingredients in the preparations react chemically with the marble or any of its mineral constituents; second, are the abrasive agents too harsh in their scouring action; third, do any of the soluble ingredients in the preparations cause trouble by crystallizing in the pores of the marble; fourth, do any of the preparations

FIG. 1—Separations of various cleaner grits. Numbers 1 to 6 are volcanic ash; Numbers 7 and 8 are crushed quartz.

discolor the marble due to chemical reactions or due to a gradual deposition of impurities.

The laboratory means adopted for studying the above questions consist mainly of a long-period scrubbing test with each cleaning preparation on a variety of marble samples. A photograph of the machine designed especially for this purpose was shown in the June, 1925, number of THROVGH THE AGES. This machine is intended to simulate, as nearly as practical considerations will permit, the actual process of scrubbing with intervening periods of drying. A large wheel on which the marble samples are mounted rotates very slowly. The scrubbing drum, which is covered with a soft felt tubing, is mounted below the sample wheel and is counterpoised so as to exert a pressure of one pound per square inch of contact with the marble. This drum is revolved at a rate of twenty turns per minute, the lower portion dipping in a porcelain pan containing the cleaning material and water. This is carried up by the felt to the point of contact

with the marble to produce the scrubbing action. Each of the thirty-six marble specimens carried by the specimen wheel is scrubbed ten minutes every time it passes the scrubbing drum. The large wheel carrying the specimens makes four complete revolutions in twenty-four hours. The test is intended to submit the marble to an amount of scrubbing which is equivalent to that ordinarily received during fifty years of actual service. The test on each cleaning preparation is continued for 720 hours, during which time each sample of marble receives twenty hours of actual scrubbing. So far as the abrasive action is concerned this test is believed to be comparable to the actual conditions over the desired period of time. However, the scrubbings being more prolonged but fewer in number, it is probable that the crystallizing effects are not developed to the desired extent. For instance, a marble floor that is scrubbed every day with a preparation containing a soluble salt such as sodium carbonate is submitted to 365 crystallizations of the salt each year while in the test outlined above only 120 are obtained.

The means of judging the effects of the test are by inspection of the scrubbed portion and by flexture tests on the scrubbed specimens for a comparison of the strength and elasticity of these with a set of control specimens. The marble specimens are in the form of slabs 4 by 12 inches, polished on one face. The scrubbing is limited to the middle 6-inch portion so that the ends are left in the original state so as to afford a ready means of comparing the appearance of the scrubbed and unscrubbed portions after the test. The marble samples as received from the producers are in the form of slabs 12 inches wide and 24 inches long. Each of these is cut into five strips, 4 by 12 inches, which are numbered consecutively from one end of the original slab to the other. Numbers 1, 3 and 5 of each sample are submitted to the scrubbing process, then after inspection are tested for strength and elasticity. Numbers 2 and 4 are tested in the original condition for the same properties for comparative purposes. A photograph of the apparatus used in determining the transverse strength and elasticity of the small slabs is shown in the January, 1926, number of THROVGH THE AGES. This was devised especially for the purpose, since the regular testing machines are not sensitive enough for light tests of this nature.

The scrubbing tests are all made on polished specimens regardless of the type of cleaning preparation. The point has been raised as to whether it is fair to make a test on polished marble with a cleaning material of the scouring type. This procedure is followed because, first, the action of the grit can be more readily determined on a polished surface; and, second, because this type of cleaner is sometimes used on polished marble.

The cleaning preparations experimented with to date have been mainly of the scouring type. Four trade materials which are the most widely used for marble cleaning in all parts of the country have received attention. In the discussion which follows they will be referred to as materials A, B, C and D. These are similar in composition and performance. Chemical analyses of these materials gave the following results:

Material	Alkaline Carbonates	Anhydrous Soap	Siliceous Matter	Volatile at 105° C.
A	8.1%	3.2%	85.8%	2.9%
B	15.4%	4.6%	62.8%	17.2%
C	8.9%	5.2%	66.3%	19.6%
D	12.4%	2.7%	73.1%	11.8%

The siliceous matter in the third column represents the scouring agent which in all

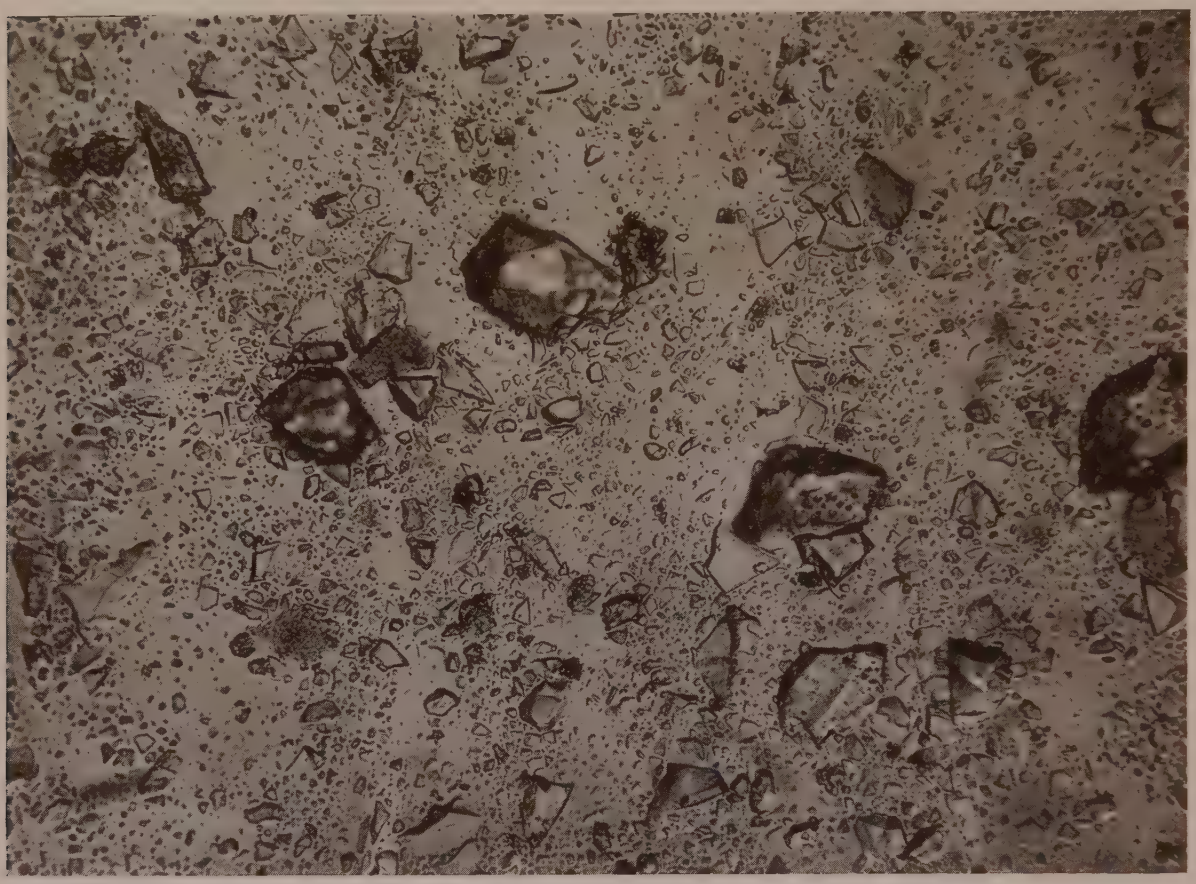


FIG. 2—Cleaner grit of the crushed quartz type enlarged 150 times. This grit corresponds to Number 8 in Fig. 1.

four of these is volcanic ash. Fineness determinations on the grits were made as follows:

	Per Cent by Weight Passing		
Material	200 Mesh	150 Mesh	100 Mesh
A	83.4	91.8	94.8
B	63.9	79.4	87.1
C	84.1	92.9	96.4
D	82.9	91.4	94.0

The above separations together with a number of others are shown in Figure 1. The fine portion at the bottom passed the 200 mesh while the top portion was retained on the 100 mesh. The dark bands between the separations are felt discs used as spacers.

Since the action of these grits is of particular interest, considerable attention has been given to their structure and constitution. While the greater number of preparations of this type utilize volcanic ash, which is a finely divided glassy material, a few employ crushed quartz. The two materials are practically the same in hardness but differ greatly in shape of particles. The ash consists mainly of flat, sharp-edged particles which on examination with a microscope resemble a mass of broken glass, while the crushed quartz particles are more granular in shape. Figure 2 is a microphotograph of a crushed quartz grit, while Figures 3, 4 and 5 are all volcanic ash. These illustrations show to some degree that the crushed quartz is more granular than those grits of the volcanic ash variety. However, an ex-

amination of the latter with a petrographic microscope reveals the fact that it contains a considerable amount of quartz.

In terms of the Mohs scale, the hardness of both grits is 7, while that of marble varies between 3 and 4. Hence one may naturally expect them to abrade or scratch the marble. The long-period scrubbing tests with the volcanic ash grits all actually showed this effect on the polished marble in a short time, while at the end of the tests the polish was practically destroyed. Some difference was noted in the amount of abrasion on different marbles due to a slight variation in hardness from one variety to another. However, this difference was not great enough to justify the use of such scouring materials on any variety of polished marble. On floor tile or any hone-finished marble it is doubtful if the abrasive action could be considered appreciable. There is, however, one consideration which should be taken into account. When these materials are used on floors, and if some of the grit remains on the floor, it is sure to act as a severe grinding agent under the action of traffic. This can be easily demonstrated by sprinkling a few particles on a slab of marble and stepping on them with a slight turn of the foot. This forces the hard particles into the marble and produces conspicuous scratches.

Since all of the cleaners containing volcanic ash have been found to abrade marble

FIG. 3—Cleaner grit of the volcanic ash type enlarged 150 times. This is the grit from the material described in the text under "A" and corresponds to Number 1 in Fig. 1.

to some extent, it becomes a matter of interest to determine if there is any particular difference in the abrasive action of different brands. To determine this point a quantitative means was resorted to which subjected the material to a rather severe process. An apparatus was used which is ordinarily employed to compare the hardness of different floor-surface materials. It is a means of determining the wear on different materials by a definite amount of grinding with a standard abrasive. It consists of a small grinding lap which is provided with a means of holding specimens on the surface under a given weight while the abrasive is fed on the grinding lap at a constant rate. By reversing the process—*i.e.*, by grinding the same specimens of marble with grits extracted from the various cleaning preparations—a test was obtained on the grits. A white Italian marble was used and the cutting power of the different scouring agents was obtained by weighing the marble specimens before and after each test. Each test was run for thirty minutes and the losses in weight caused by the different grits were as follows:

Grit from Material A, abrasion 1.36 g.
Grit from Material B, abrasion 1.30 g.
Grit from Material C, abrasion .92 g.
Grit from Material D, abrasion 2.21 g.

Since these tests place the materials under conditions considerably different from those of actual use they are open to criticism, but

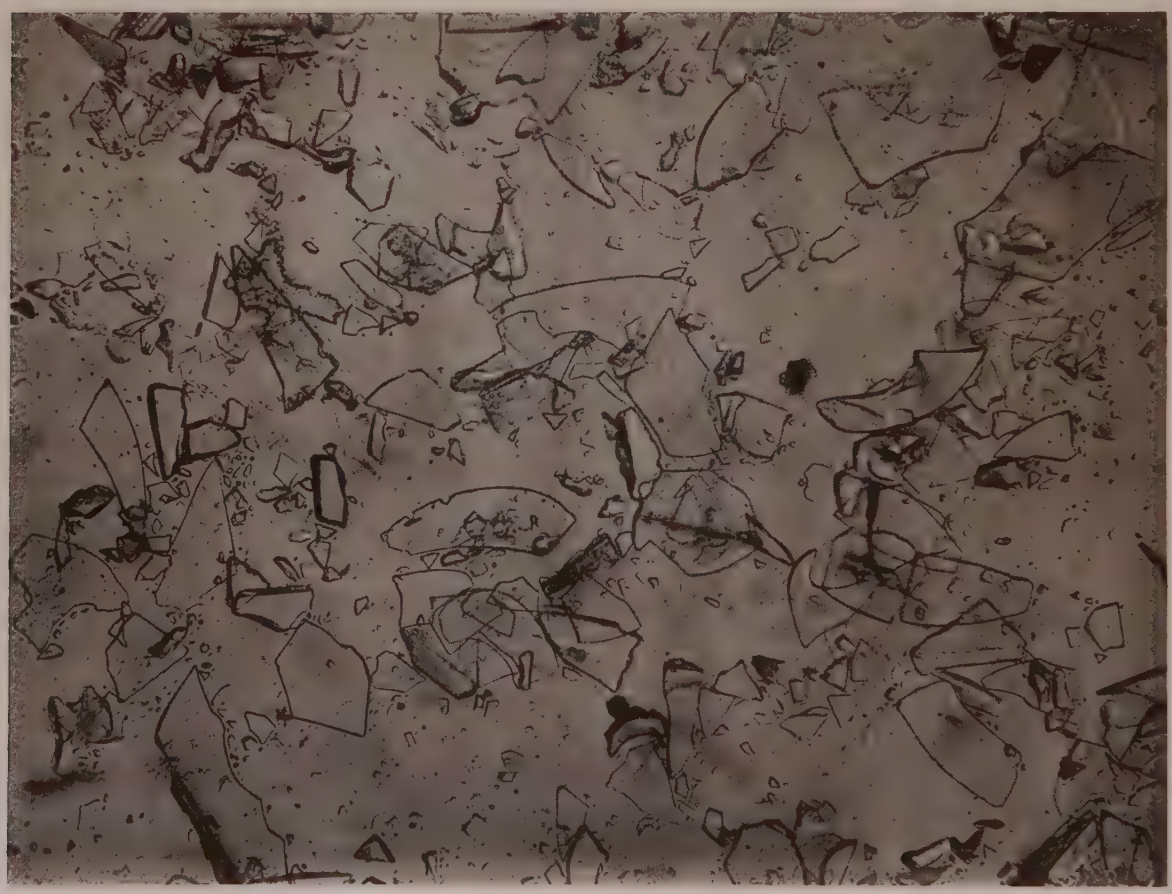


FIG. 4—Cleaner grit of the volcanic ash type enlarged 150 times. This is the grit from material "B" and corresponds to Number 2 in Fig. 1.

FIG. 4—Cleaner grit of the volcanic ash type enlarged 150 times. This is the grit from material "C" and corresponds to Number 3 in Fig. 1.

as all were subjected to identical conditions it is believed the results have a comparative value. They indicate that the most severe grit abrades marble about one-seventh as rapidly as No. 60 emery; that there is an appreciable difference in favor of the brand having the largest amount of small particles; and with one exception the cutting power varies inversely with the fineness. Material B, according to the sieve tests, is the coarsest, but its cutting power is next to the least. This is believed to be due to the fact that the particles are mostly flat and very thin. Many of these are broken under pressure, which is proven by sieve tests on a sample of the grit after use in the above test. The results of this test were as follows:

	Percentage Passing		
	No. 100	No. 150	No. 200
Original Grit B	87.1	79.4	63.2
Same after test	95.3	92.3	84.2

In this test no account was taken of the marble dust formed by the abrading action. This dust was evidently so fine that it all passed the different sieves. Hence, to be exact, one should apply a small negative correction to all the percentages indicating the amounts passing the sieves. This correction would probably not amount to more than 2 per cent.

A further test was made on the part of a volcanic ash grit which passed the 200 mesh

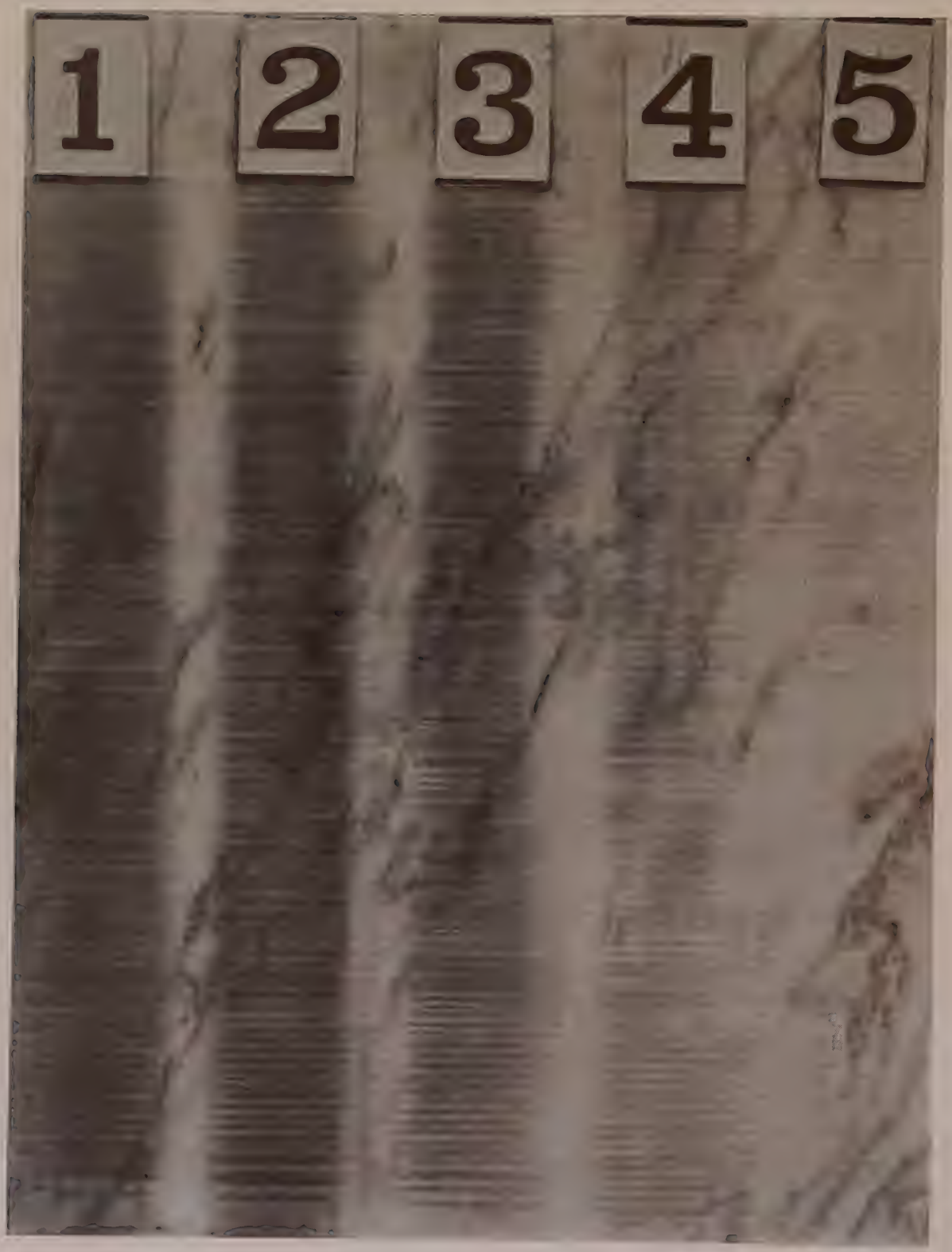


FIG 6—Abrading action of various grits on marble Numbers 1 and 2 were scrubbed with volcanic ash cleaners, and 3, 4 and 5 with powdered marble, powdered soapstone and powdered gypsum respectively

sieve and the amount of abrasion was found to be 0.73 grams, as compared to 1.30 grams on the unsieved material. This indicates that the abrasive action of this type of material could be diminished by sieving out the coarse particles.

As a matter of comparison of the volcanic ash grits with the crushed quartz type, the same abrasive test was made on a sample of the latter type which indicated an abrasion of 4.82 grams or a cutting action nearly one-third that of No. 60 emery. The severe cutting action of this is probably due to the granular shape of the particles.

In view of the severe abrasive action of all of the grits of the silica type it is desirable to find some material of a softer nature which will answer the purpose without abrading the marble. Three materials have been experimented with, as follows: crushed marble, crushed gypsum and crushed soapstone. The hardness of the last two, in terms of the Mohs scale, are 1 to 2 and 1 to 4 respectively. The amount of abrasion in the grinding test with the three powders containing all the materials passing a 65-mesh screen, were as follows:

Crushed marble	0.51 grams
Crushed soapstone . . .	0.57 grams
Crushed gypsum . . .	0.00 grams

In order to illustrate the abrading action of some of the different scouring grits on polished marble, the slab shown in Figure 6 was scrubbed repeatedly along certain paths as shown under the numbers at the top. Along the paths labeled 1 and 2 the trade cleaners B and C were used, and along 3, 4 and 5 were used marble powder, soapstone powder and gypsum powder respectively. The last three were each mixed with 5 per cent of soap powder. The scrubbing was done with a contrivance consisting of a piece of felt 2 inches long and 5/8-inch wide attached to a handle which was loaded with a 10-pound weight. Each cleaning material was submitted to the same process, viz: 100 strokes of the weighted felt over the surface, which was sprinkled with the dry powder and moistened at the start and after every ten strokes. In order to make the abraded parts of the marble show in a photograph, the whole slab was cross-hatched with a pencil. Where the polish was removed the pencil marks are clearly visible, but on the polished part they are very faint. This shows that the greatest abrasion was produced by the silica grits, and that the marble and soapstone grits caused considerable abrasion and the gypsum practically none.

These results indicate that the marble and soapstone grits abrade marble to an appreciable extent and that gypsum has no appreciable abrading action. This fact offers some encouragement for the use of powdered gypsum as a scouring agent. However, there is one consideration which may prevent its use for the purpose, *i.e.*, it is slightly soluble in water and it would act as a water-hardener. For this reason it would probably not prove satisfactory for use in connection with soap, since a considerable amount of lime soap would be formed, and this would prove detrimental. It might be found satisfactory for use in connection with other detergents, such as sodium carbonate or tri-sodium phosphate. A soapstone might be found which would not prove to be as harsh as the one used in the above experiment. This material would probably not exert any appreciable hardening effect on the water and could be used with soap.

The problem of finding a suitable scouring agent for use on polished marble is receiving further attention. In an article to follow very shortly, other features of the experimental work on cleaning preparations will be discussed.

THE STYLE OF HENRY II

Advanced Roman Renaissance Begins to Make Its Way Into France

THE period of the Advanced Renaissance in France dates from about 1530 and covers the latter part of the reign of Francis I, as well as the reigns of Henry II, Francis II, Charles IX and Henry III, concluding with the death of the latter in 1589.

As we have pointed out in past articles of this series, the style as practiced under Francis I had begun, even before his death, to be influenced by the advanced Roman Renaissance, due mainly to the influx of Italian artists into France. The new era deserved, through the wide activities of the Italian Catherine de Medici, to be called by her name; nevertheless it is usually known by the name of her husband, Henry II. Its best structures were built during the reigns of this monarch and Charles IX, and the most prominent native architects of this central period were Philibert de l'Orme, Pierre Lescot and Jean Bullant.

The transition from early to advanced Renaissance contained two classes of work. The first class is represented by such buildings as the Hotel d'Ecoville at Caen and the house in the Rue de Recouvrance at Orleans.

Illustrations, except as noted, courtesy Thomas Machen, architect, Baltimore.

In these the general design is Francis I, but the detail is classical. The second class, represented by such buildings as the chateaux of Serrant and Landifer, and the Chapel of St. Romain at Rouen, have a more classical design, but retain the early Renaissance detail.

One of the most important influences upon French art about this time was the gathering together at Fontainebleau of a group of architects, painters and workers in wood, stucco, etc. These men, attracted by the proposed extensive additions to the old castle, formed a brilliant concourse of artists.

De Rosso, or Battista Di Giacopo as he was known in his native land, was an Italian engaged by Francis as the superintendent of the stuccoes and paintings. He arrived at Fontainebleau in 1530, and from this date the new era began. He designed, very probably, the connecting wing, containing the Gallery of Francis I on the first floor. This wing had long windows flanked by Doric pilasters and shallow panels, and surmounted by an unbroken entablature and tall stone dormers with rather odd pediments. The gallery was about 165 feet long with a width of 20 feet and was elaborately treated with stucco decoration in high relief. The walls were divided into panels of various sizes and the manner in which the color and relief are combined was probably Rosso's own idea.

Chief among the other prominent Italians who displayed their ability at Fontainebleau were Primaticcio, who is credited with the chimney piece of Queen Eleanor's room, the decoration of the gallery of Ulysses, and of the vestibule in the Pavillon de la Porte Dorée; Cellini, who did the celebrated bronze Nymph, now in the Louvre; and

Courtesy University Prints.

Façade, Hôtel Carnavalet, Paris, by Lescot and Goujon.

Serlio, to whom is attributed the Grotto of the Pines.

Almost coincident with the inception of the school of Fontainebleau was the rise of a distinctly national group of architects. Jacques du Cerceau had returned from studying at Rome and opened up a studio at Orleans in 1534. He was filled with the greatest admiration for the Roman Renaissance and he published during his life many works on the structures of Italy. Though he never designed, particularly during his early years, any buildings of really great merit, it seems probable that he was the creator of the plans for certain houses in his city, including those known as Jean d'Alibert and La Coquille, and perhaps the east end of the Madeline church at Montargis.

Pierre Lescot and Jean Goujon collaborated for a number of years and each in his own way may be credited with advancing the French Renaissance to a considerable degree. Goujon was originally a mason and a sculptor, and his monument in the Lady Chapel of the Rouen Cathedral to Louis de Brézé has usually been considered the earliest work of the advanced Renaissance by a native Frenchman. This was begun in 1535, and in 1541 he made the marble columns beneath the organ loft at St. Maclou, and the fountain on the grounds around the church. Later, he made the chapel fittings at the chateau of Ecouen. Lescot, who is known chiefly as the architect of the Louvre, was responsible for the rood screen in the church of St. Germain l' Auxerrois in Paris, erected in 1541. In 1544 the two men began the Carnavalet mansion, one of the most noteworthy town houses of the period.

Philibert de l'Orme received an early training as a builder and, like Cerceau, made

The connecting wing at Fontainebleau. The Oval Court and Baptistry are shown. The wing contains the so-called gallery of Francis I, probably by Il Rosso.

The gallery of Francis I on the first floor of the wing at Fontainebleau. It was not quite completed when the architect and decorator, Rosso, committed suicide upon discovering he had wrongfully accused a friend of embezzlement.

the "Italian tour." After his return, he designed several minor works, and began the Chateau of St. Maur for Cardinal du Bellay. He showed a surprising knowledge of advanced principles. The original chateau design consisted of three wings, with basement, principal story and attic, and a one-story flat roofed gallery. The basement and coigns were rusticated, and the windows had architraves and broken pediments, giving an Italian look to the elevation. Jean Bullant, trained as a mason, received his chance to study architecture in Italy through the charity of his patron, the great Constable, and in 1545 found employment at the Chateau of Ecouen, where he came under Goujon's influence.

All of these men exhibit that versatility that was common at the time—the ability to join the practice of architecture with other arts. They wielded the painter's brush, the sculptor's chisel or the mason's trowel with equal facility, and, as in the cases of Goujon and Bullant, they showed a considerable ability at times with the pen.

"The points in which the Frenchmen differed from the Italians," says W. H. Ward (Renaissance Architecture in France), "were first that they broke less completely with Gothic tradition and had a less complete mastery of the principles of classic design, and secondly that they had a firmer grasp of construction and attached greater importance to it and to its influence on design. In these differences lies the secret both of their weakness and their strength. Their constructive dexterity led them to emphasize structural forms merely because they were clever. Their incomplete knowledge of the grammar of classical architecture and

its limitations sometimes led them into grotesque eccentricities when they attempted to use it for expressing French ideas. At the best they fell short of the complete harmony and perfect rhythm of the best Italian work. On the other hand, their very failure to bend the stubborn orders to their will was beginning, towards the end of the period under review, to teach them how they might work out for themselves a type of building in which the orders should hold at most but a subsidiary place and the design, while disciplined into classical orderliness and Latinized in detail, should remain characteristically national.

"Another aspect of architectural development at this period is the commencement of some definition of the architect's functions, and the gradual emergence of the architect in the modern sense. It is often possible henceforth to class a building on examination not merely in a style but as the work of a certain man. This individual character was, it is true, somewhat obscured in the following century under the reign of uniformity imposed by the tendency of the age, but under Henry II absolutism and centralization were but in embryo and the individual spirit of the Renaissance yet unexhausted."

Hôtel de la Chancellerie, Loches, begun in 1520. Built by Francis I and Henry II.

Time Proofing The Sun Parlor

No matter how the rain and snow beat in, or the sun glares, the sun par lor floor of marble remains impervious to stains or warpings. It retains its original appearance despite the wear and tear of the elements and the poundings of many feet.

THE GIRARD COLLEGE GROUP

"Redeeming what was lovely in the ancient pile from the decay of the centuries"

GIRARD COLLEGE, in Philadelphia, was founded in 1848 under the will of Stephen Girard. Girard, who was the richest man in America at the time of his death in 1831, left about $6,000,000 to establish an institution for the care of "poor, white male orphans." The College is a home as well as a school and comes nearer the boarding school ideal than the ideal of an orphanage. It has a normal capacity of over 1,500 pupils, and there is a waiting list of from 600 to 700 boys.

Girard's will as originally drawn directed that the College should be located on the square of ground bounded by 11th, 12th, Chestnut and Market Streets, but in a codicil he said he regarded this as a mistake, and directed that the institution should be built on the Peel Hall Farm, on Ridge Road in Penn Township, which he had previously acquired. It is on this latter site of forty-five acres that the group of buildings was located, and though at first the College was in the country, as mentioned by Charles Dickens in his *American Notes*, by degrees the city was extended about it on every side.

In shape, the tract is rectangular, reaching from 19th to 25th streets east and west, and from Poplar to Thompson Streets north and south. The corner stone of the main building

The Main Building of Girard College has set the architectural standard for the entire group. The exterior is entirely of marble.

was laid on July 4, 1833, and the original plans included four other buildings—two to the east and two to the west of this main structure. There was also specified that an enclosing wall should be constructed 14 inches thick and 10 feet in height, to be capped with marble. This is slightly over one and one-quarter miles in length.

The Philadelphia City Councils had, according to the terms of Girard's will, about $2,000,000 at its disposal to be used for the erection of the buildings of the college. Accordingly, a competition was held, and the best architectural plan was to receive $400, an insignificant sum compared to present-day standards. The winner was Thomas U. Walter, a young architect of the Franklin Institute, in Philadelphia. Walter later was the designer of the Government breakwater at Venezuela, and the extensions of the Federal Capitol, the Patent Office, the Congressional Library, the Treasury and Post Office Buildings and the dome of the old Capitol, all at Washington.

The original plans of Walter for the main building of the Girard group was for a large showy structure, somewhat lacking in simplicity and purity. Nicholas Biddle, president of the new board of trustees, prevailed upon the architect to prepare drawings for a new and different building.

Commenting on this phase of the building scheme, Dr. C. A. Herrick, the present head of the College, said recently: "Biddle felt

that a standard of taste was one of the greatest needs of America at that time when, as he said, 'individual wealth is hastening to indulge its taste, where every state, city and county requires extensive public buildings.' He believed that the plan which he had secured would serve as a standard of great influence. Walter's task was difficult, as he had few precedents to guide him in designing one of the great monumental buildings of America."

Since its erection, the main building has been regarded as one of the interesting sights of the Atlantic seaboard. It fully justifies the words of Joseph R. Chandler, who said of it while it was yet in process of construction: "Redeeming what was lovely in the ancient pile from the decay of the centuries, we seek anew to affect the minds of the young by the permanently beautiful, in whose influences they are to be reared."

The "sumptuous Temple of Lysicrates" furnished the model for the edifice, but it cannot properly be termed a Greek temple. As the Dean of the School of Fine Arts of the University of Pennsylvania expressed it: "The building is a fine example of what the Greeks might have done if they had not been submerged by the Romans just as they were developing their Corinthian order. The noble monuments of the Greeks were in Doric and Ionic orders." The specifications in the Girard will limited the length of the building and Walter always regretted that he could not increase the north and south length so as to maintain the conventional relations be-

Another view of the Main Building, with its stately columns.

tween the pillars on the sides and those on the ends.

There are eleven columns on each side and eight at each end, counting the corner columns twice—a total of thirty-four. Each is 6 feet in diameter and 45 feet in height, except that the corner ones are 1½ inches greater in diameter, in order to overcome a possible sense that they were smaller, an illusion likely to be caused by their more isolated positions. Further, the architect reported that he had caused them to be given the usual entasis. These columns were built of solid marble and cost $12,994 each, of which amount $1,028 was for the rougher stone. The building itself is 169 feet long by 100 feet wide with a height of 97 feet. It was faced entirely with a marble quarried near Norristown, and known as Pennsylvania marble. This is a bluish-white material, very hard in texture with a fairly good surface. The same material was used for the columns and for facing the other four buildings, built from 1835 to 1847, that were included in the original plan. The capitals to the columns of the main building were carved in Italy and are of an Italian white marble that blends very well with the Pennsylvania stone. Every piece of marble in the main building was set on pieces of milled lead to prevent any fracture at the joints; every stone was dowelled into the stones above and below and at each end; and the marble exterior was securely fastened to the interior brick and stone work by means of heavy cramp irons. In general throughout the group the Pennsylvania material was finished in six and eight cut toolwork and laid up in range rubble masonry.

The substantial character of the central structure can be determined from the fact that the outside foundation walls and the walls separating the cellars under the rooms from those under the vestibules are everywhere over 6 feet in thickness, while the rest of the interior foundation walls are over 3 feet through. The walls supporting the marble columns are 9 feet 9 inches thick.

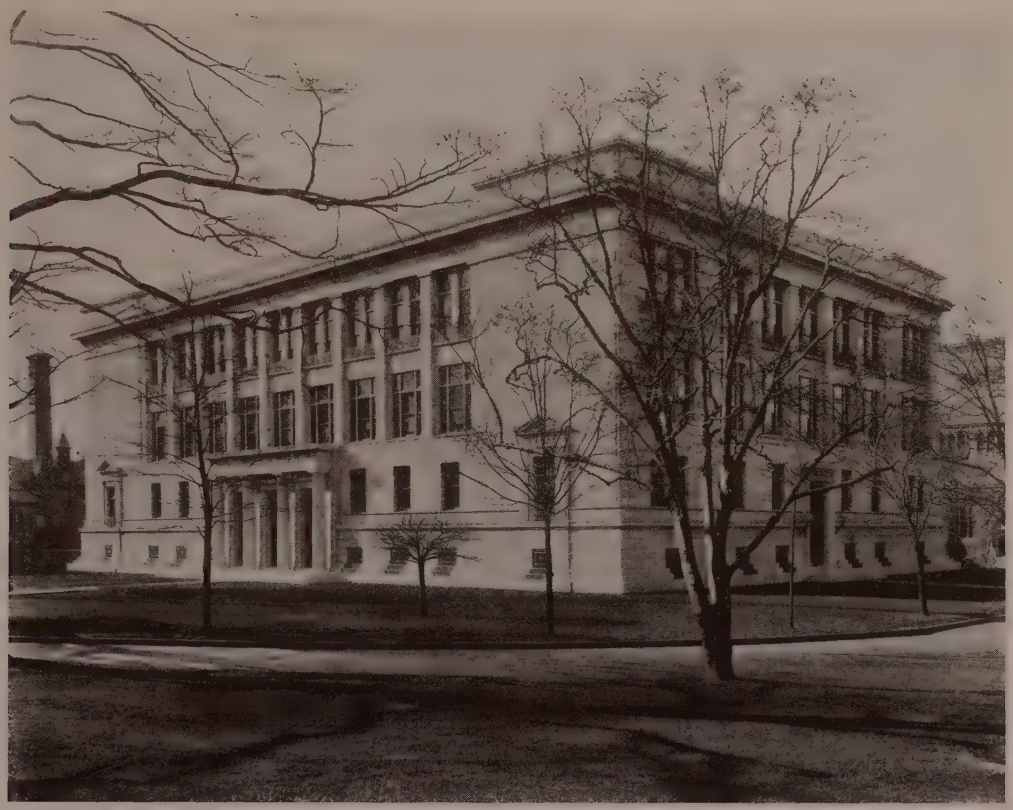
The stairs at the four corners of the main building have been of special interest to visiting architects. Walter described them as "geometrical stairs." They were built with each step resting on the one below and locked securely in place from the bottom to the top, the stairs thus distributing pressure throughout the flight. The supporting strength results from the application of the key principle of the arch.

The entire structure was not completed for fourteen years, but if one considers its size and the inevitable difficulties in assembling material and securing workmen at that period of the country's history, this time does not seem excessive. On the inner faces of the porticos that can be seen from the second floor windows and from the north and south doorways, are the dates when these several porticos were completed, and the names of the architect and the marble mason, one Findlay Highlands.

The four buildings flanking the main building east and west were erected in accordance with the instructions left by Girard, and these were built from 1835 to 1847. They were all faced with the Pennsylvania marble, and their lines followed the Grecian style.

In 1851 a sixth building was completed that was originally intended to furnish facilities for a laundry, bakery and a larger storage of water. It was known among the boys of the College previous to the eighties as the "wash-house" and was finished in rough cast, of the same sort of stone as was used for the lower portion of the wall about the grounds. Later, when the College was placed on the city water mains, this building was used as an office, with space for dormi-

Looking through the big marble columns of the Main Building portico, with the High School in the background.



The High School building, begun in 1913, has an exterior of two kinds of white marble. John T. Windrim, Philadelphia, architect.

tories and section rooms. In 1881, an addition was made in marble and the original part of Building Five, as it was called, was covered with plaster. In the meantime the Infirmary had been built in 1857, but no marble was originally used on the exterior. Immediately after its completion, there arose a storm of criticism to the effect that it was unfortunate that a building had been erected which was as inelegant as the others were elegant, and that its exterior contrasted strangely with the exterior of the other buildings. It marked, said the Visiting Committee of Councils, "the second period of degeneracy" in the architectural taste of the Directors. The new parts of the Infirmary, which included the south end and the wing, were added in 1881 and 1897. These were built of marble and the old building was taken down and reconstructed of White Vermont marble to correspond with the other units of the group.

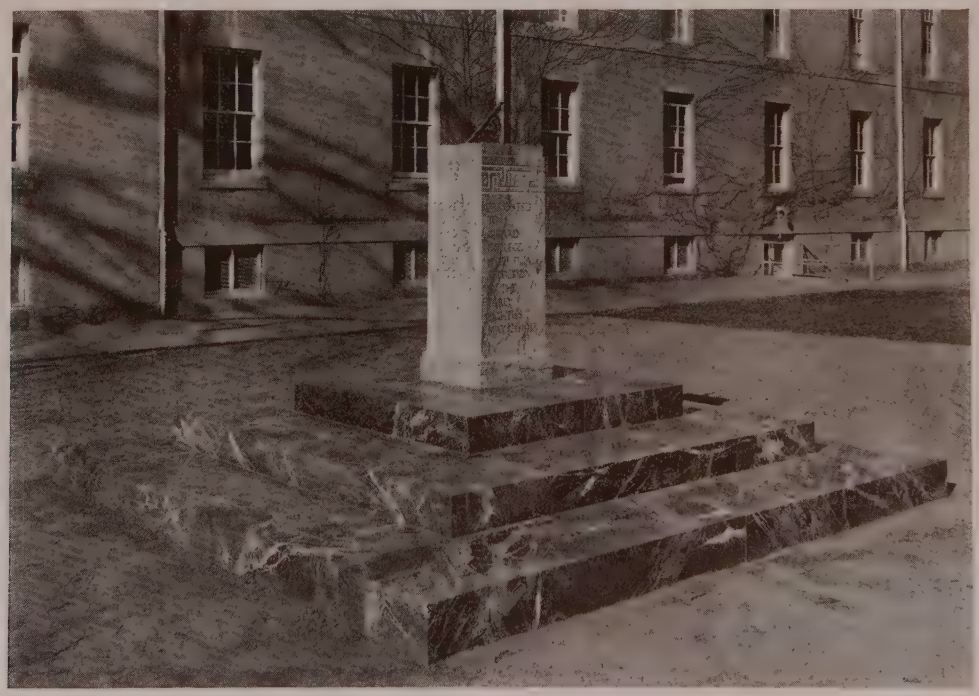
Up to 1870, these buildings constituted Girard College. A period of building activity began in 1873 and continued up to 1890. During this time were built the group known as numbers 7, 8 and 9; a school building called number 10; and a chapel. All of them were designed by James H. Windrim, of Philadelphia, who admirably adopted for them a Collegiate or Victorian-Gothic style. It is interesting to note that the College Hall of the University of Pennsylvania, designed immediately before number 7 was built, was in conformity with the same architectural style. Lee marble, a white stone from Massachusetts, was used for the facing, and was laid in broken range rubble with vertical and horizontal jointing. The trimmings, such as lintels, doorways and similar details, were

from the Pennsylvania quarries that had supplied the stock for the earlier structures. These quarries had been abandoned, but were opened up to serve this stage of the Girard development.

The next important addition to Girard College was the erection of a new High School building, to provide accommodation for about 800 boys. It was begun in 1913 and occupied in 1916, and its architecture reverted once again to the Greek style, its spirit and character being similar to that of the original group. It is faced with Vermont marble in two shades of coloring, the base being a darker shade of a bluish-white marble, and the superstructure of white Florence Vermont. The halls and stairways are finished in Napoleon Gray marble. John T. Windrim, of Philadelphia, son of the James H. Windrim who designed the buildings erected during the middle period of the College's history, was the architect.

The Recreation Building, also by John T. Windrim, was finished in 1924. This is faced with Highland Vermont marble above, and gray Vermont below, laid in range rubble work, tool finished. The halls and corridors of the interior, as in the High School, are finished in Napoleon Gray from Missouri.

All the buildings of Girard College are worthy of admiration, but the main building is monumental. Dr. Herrick says of it: "Architecturally it has set the standard for the other buildings, and it probably will for all time dominate the group of which it was the original construction. This is well, for the main building is a noble structure. Imposing in design, impressive in location, this building will be accepted as symbolizing Stephen Girard whose body rests within its walls. Like Girard's conception of his school, this building has grandeur; like his philanthrophy, it is lofty and noble; like his tender solicitude for the needy and unfortunate, it reaches toward heaven. To an increasing degree in the future will the grounds and buildings be affected by this 'dear Temple on the Hill'."



Marble monument presented to Girard College by the "Early 80's."

A CENTURY-HOUSE OF MARBLE

A Vermont Dwelling Rich in Historic Interest That Has Withstood the Stress of the New England Climate

THROUGH one of Vermont's old historic towns runs a quiet, tree-bordered street. It is a typical New England thoroughfare, wide, well-shaded, and permeated with that atmosphere of peace and contentment which is the richest possession of all such towns. Its houses, set discreetly back from the winding sidewalks, are fine examples of a type of architecture common about 100 years ago. Built during the period when the Colonial style predominated, they are plain, well preserved, dignified, and in perfect harmony with their surroundings.

One of these houses, modestly withdrawn behind a giant maple, impresses the passersby as a dwelling of unusual distinction, both from an artistic as well as a practical point of view. It is endowed with a perfect setting. Rising directly in the rear is a friendly green hill which, in its inherent loveliness, forms an appropriate background for the whiteness of the structure. At the front are towering elms and maples whose limbs curve

out majestically over the street, bringing welcome shade during the heat of summer. Flowers and shrubs grow with delightful irregularity on the small terrace. One could easily imagine that the hand of nature had made a special dispensation to protect this dwelling from the elements.

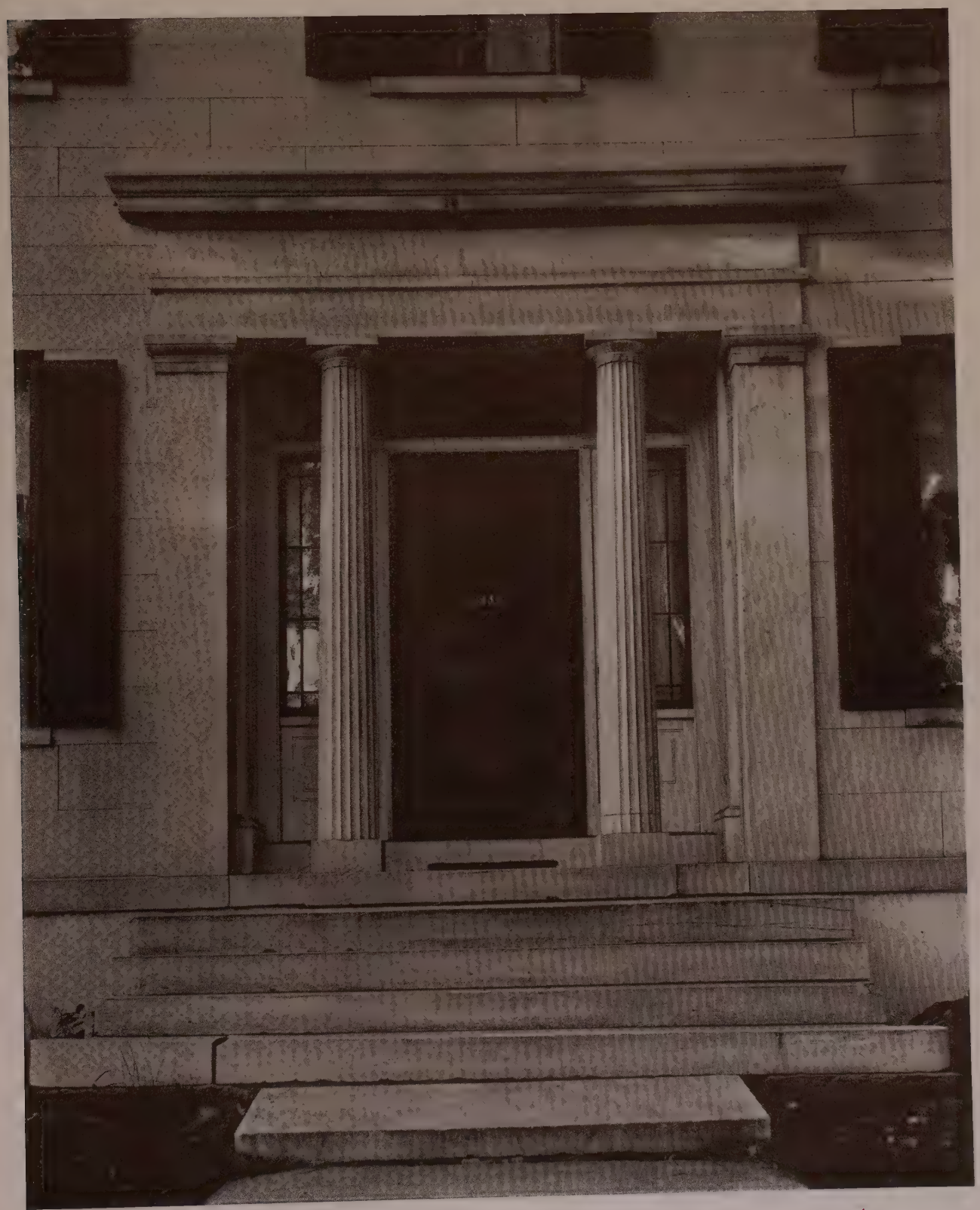
The house itself is of marble, clean and unspotted. In the walls are many large smoothly finished blocks, five feet or more in length. The marble, which is of a white bluish veined variety, has retained its original lustre and soft tones through the severe bombardment of over ninety Vermont winters. The underpinning, also of marble, is laid out on the same plan as the superstructure and is a fine tribute to the honesty and painstaking care of the builders. After nearly a century of use, the floors are found to be exactly level and the walls plumb. It is rather remarkable to note that, aside from the modern wooden piazza on the east end, practically no alterations have been made in this fine old residence.

The front doorway is especially noticeable on account of its classical appearance. It would require but little imagination to believe that at some remote period this entrance might have dignified an old Greek edifice. The fluted columns are solid pieces of white marble, surmounted by appropriate caps of the same material. One wonders how those old craftsmen were able to execute such perfect workmanship with such poor facilities. The pilasters are in unbroken sections of blue-veined stock, while the steps leading up to the entrance are huge slabs of white marble. The door is skillfully carved from an old piece of San Domingo mahogany some three inches thick.

The interior of the house was planned with the same idea of simplicity and utility. The rooms are generously large and, in accordance with the style of that period, the ceilings are very high. All the doors on the first floor are of solid mahogany, while on the second they are of walnut. Due to the thickness of the walls, the large windows are recessed, giving a delightful niched effect. The attractiveness of the two connecting parlors on the west side is heightened by marble fireplaces exactly alike, whose fine white mantels harmonize well with the decorative scheme. The construction of these fireplaces is a very noticeable feature, as they are laid out entirely on straight lines. This type of design brings to the interior the same simplicity of detail which characterizes the exterior. It is a home equally impervious to bitter winter winds and summer's penetrating heat, this latter quality bearing out the old Roman belief that marble walls made the rooms fresher.

Situated in Brandon, a town locally known as "Vermont's Beauty Spot," the house enjoys quite a peculiar, as well as an interesting, history. The marble came from a small quarry, independently operated, about two miles from the village. The blocks were cut and finished at the quarry and hauled to the building site by oxen. Shortly after the completion of the house this deposit was exhausted and the project abandoned. Not long before the close of operations, a vein was uncovered which yielded fine-grained, pure white marble, but after a few slabs of flawless quality had been removed, the supply suddenly failed and with the failure came the collapse of the enterprise.

Old homes of this type inevitably accumulate little human interest stories, many of which furnish amusing sidelights on their history. It seems that this time-honored dwelling has always been sought after by would-be purchasers. Among them was a marble dealer who at one time felt so sure of acquiring the property that he went so far as to build, in anticipation of improving the



Front entrance of the 100-year-old white marble residence in Brandon, Vermont.

front entrance, an attractive marble porch containing some finely turned railings and balusters. His long-looked-for purchase failed to materialize, however, and at last he found himself under the necessity of carrying his marble work and his disappointment to a less pretentious house. Today this handsome marble porch may be seen embellishing the front elevation of a small country cottage a mile outside of town.

Although this most appropriate addition missed its mark, the structure for which it was intended is unaffected by the loss. The quiet dignity acquired by the seasoning of time is sufficient in itself to give distinction to this heritage of the early days. This century-old home gives every promise if left undisturbed of continuing to shelter many future generations with the same degree of comfort and protection that it has sheltered its past tenants.

At the same time it serves as a constant reminder to those who build for something more than the plaudits of the present generation, that marble as an exterior material offers the utmost in both beauty and durability.

Old marble fireplace in Brandon, Vermont, residence.

THE AQUILA COURT BUILDING AT OMAHA, NEBRASKA

The Architects, Holabird & Roche, Were Inspired by York Terrace and Belgrave Square, London

IN practice, as in theory, the idea that a commercial building must be drab and graceless has been relegated to the architectural dust bin. Business no longer flaunts its "bigness" in terms of bare utility, and beauty has left her sabbatical shrine to invade the realm of caissons and steel girders. The idea today in the erection of public buildings, both large and small, is convenience of layout plus excellence of design. Yet it often happens, especially in the erection of huge projects, that the design element is unavoidably limited because of necessary structural features or because of the forced economy which the great expense of building entails.

The design of the smaller shop and office building, therefore, offers unusual freedom

to the architect. Here there is a real opportunity for the development of individuality. In the past, this type of structure has not been common outside of New York and its environments. So real a need does it fill, however, and so enthusiastic has been its reception that it is becoming popular in the western sections as well.

Such a one has recently been erected in Omaha, the Aquila Court Building, devoted exclusively to specialty shops, professional offices and studios. Twenty years ago such a combination would have resulted in dreary apartments, a dim, close inner court and barren store space. Today the result is charming. Fronting an entire block on Howard Street and extending back to the alley on the 16th Street side, is a formal Georgian office building, four stories in height. In the rear and facing a sunny, flagged courtyard, which opens on to 17th Street, is a low, two-story wing that houses a few shops and a tea room on the first floor and studios on the second. The two wings

View of court from Seventeenth Street entrance.

with their enclosed court form a group of unusual appeal.

Architecturally it adheres closely to the Georgian tradition and its charm lies in the formal simplicity and dignity of its execution. Buff colored stone forms the exterior of the office structure on all three street frontages, but the studio wing and that portion of the office wing which fronts on the courtyard are faced with brick and lightened with stone trim and base course.

Dominating the long Howard Street façade is a central pavilion which marks the entrance to the office building, and the importance of this feature is emphasized by the use of engaged columns of modified Corinthian as against that of pilasters on the end pavilions. All windows throughout are double hung, and what is most unusual in a structure of this character, they all have muntins. Their use gives scale to the building and does away with the "bald" appearance which is so common a fault of business structures. The second story windows, moreover, are out to the floor level and set off by the use of ornamental iron balustrades. Besides adding interest to the exterior, this arrangement greatly increases the value of the second floor rooms as shops, for the appearance of the room on the inside is thereby heightened. Nor are the slate mansards of purely ornamental nature. The center one is used, the front part of it affording valuable rental space and the rear being utilized as an elevator room.

Inside as well as out, the Georgian tradition is dominant. The lobby with its Travertine walls, vaulted ceiling and "pineapple" doorways, similar to the entrance hall of Mottram Hall, Cheshire, England, extends back to the courtyard and opens a charming vista to the person entering from the street. Three elevators serve the building from this lobby and a stairway ascends from it to the upper floors. The corridors throughout are unusually wide and spacious. Paneled walls, marble floors and lighting fixtures flush with the ceilings all help to achieve a more finished effect than is usually found in an office building, an effect which is augumented by the nicely proportioned arches that open from the elevator lobby into the corridors. These corridors have gray Tennessee marble tile blocks with Belgian Black marble bases.

The studio wing at the rear of the lot has been designed in harmony with the office section, although its type is more residential than commercial in character. Entering from the long courtyard through the arcade and entrance hall, one ascends to the second floor hall and thence to the glass-enclosed loggia from which the studios open. Just inside the door of each apartment is a tiny kitchenette and breakfast nook. Beyond this is the big studio room, two stories in height, with a large open fireplace and lofty windows overlooking the courtyard. At one side of the room a stairway leads to the balcony located above the kitchenette and on this balcony the bath and sleeping quarters are situated. The toilet rooms are all in Carthage marble except the floors, which are gray Tennessee.

A gay little tea room with sturdy Spanish furniture, looking out onto the court, occupies a great deal of the space on the ground floor of the studio wing, the remainder of the space being assigned to a few shops and a necessary backing-in space.

Not the least important among the features of the building is the courtyard paved with bluish flagstones and planted with tall poplars and bushy evergreens. At the east end a fountain feeds the pond and the long canal.

Cloisters run the length of the buildings on either side and from them open the vari-

Section of a typical upper corridor in the Aquila Court Building. The floors are Gray Tennessee marble; the wall bases are Belgian Black.

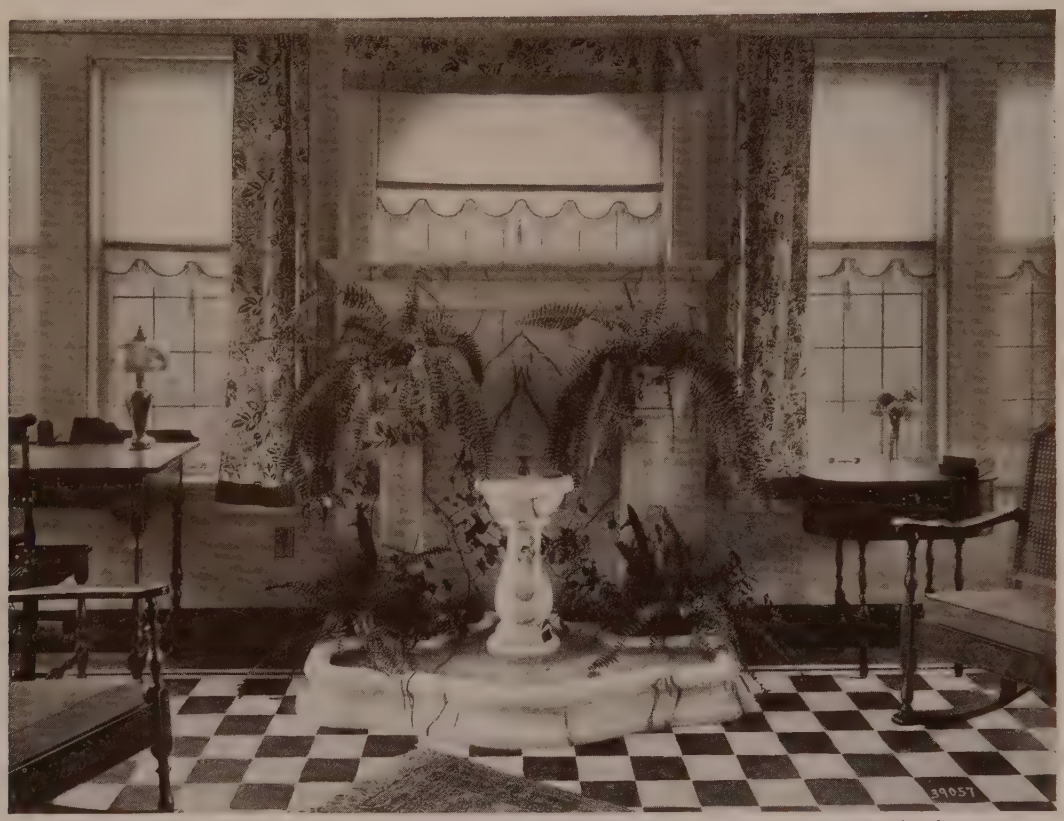
ous shops, many of which have ceilings high enough to permit balconies, and thus afford the tenants an unusual opportunity for originality of treatment.

The courtyard is a colorful spot, moreover, for the brick arches which form the two long cloisters have white reveals; the store display windows are finished in peacock blue with orange striping; and the windows on the upper floors are protected by brilliant Italian awnings.

The treatment of the courtyard and, indeed, the basic idea of the group as a whole, is the outgrowth of an experiment which the owners, Messrs. Chester A. and Raymond C. Cook, conducted a year or so ago when they made extensive improvements on a group of buildings at the corner of Michigan Avenue and Ontario Street in Chicago. The novel scheme—shops, studios, courtyard—attracted much favorable comment and although it is usually the case that shops and apartments opening onto an inner court produce less rental than those facing on the street, the reverse almost proved true.

The new building in Omaha is already proving itself a financial as well as an artistic asset to the owners as to the city.

Elevator entrance, Aquila Court Building, Omaha, Nebraska. Holabird and Roche, architects. The floors are of Gray Tennessee marble; the walls are of Travertine with a base of Belgian Black marble.



An illuminated mantel aquarium installed in a Milwaukee residence. It was made of Pedrara Onyx, and is a combination of mantel, flower vases and fountain. Electric lights concealed in the fountain stem furnish a soft light sufficient for ordinary use.

MARBLE IN THE HOME

Its Use in the Kitchen, Bathroom and Sun Parlor is Rapidly Increasing

THE average man is deeply impressed by the display of marble in the commercial structures and monumental edifices that he chances to enter. He will walk into the present-day bank, hotel lobby or art museum and admire the luxuriousness of the marble wainscot, the beauty of the marble floor, the dignity of the marble columns and the imposing sweep of the marble stairway; he will seldom, however, pause to consider that this very same material may be used to afford equally striking effects in his own home.

He has accustomed himself to think of marble as a semi-precious stone, eminently suited for the palaces of kings, the glorious cathedrals of the world and the mightiest memorials of the nations of the globe. The use of the word "marble" itself is apt to conjure up in his mind something like a composite picture of the Taj Mahal, the Temple of Solomon and Saint Peter's at Rome.

It is true that marble is one of the oldest building materials known to man, and that it has played an important part in enriching the finest and most enduring structures of the ancients. The Greeks used it for their

most important temples and each Phidias and Praxiteles employed it for his sculptures. The builders of Rome brightened their walls of brick and concrete by trimming them with an abundance of the varicolored slabs, and they laid down in their palatial homes marble floors executed in the most intricate patterns.

It is, however, equally true that marble today has a much more practical use than it enjoyed in olden times. With the development of the American marble deposits, the invention of modern machinery for quarrying, cutting and polishing the stone, and the perfection of transportation facilities for its quick and economical shipment, there has come about a more general realization of the advantages of marble for the more modest projects.

It has always been felt that certain types of residences need at least a trace of marble in their exteriors to relieve the monotony of brick, for instance, and to endow the elevations with the glow of life and the suggestion of rugged endurance. Moreover, marble window sills are a constant source of pleasure to the housewife. Rain or snow does not mar them. They do not have to be repainted, and their brilliant surface is an attractive feature to the occupants of the rooms.

But the use of marble for the interior as

This finely carved marble mantel is the dominating feature of an otherwise ordinary living room.

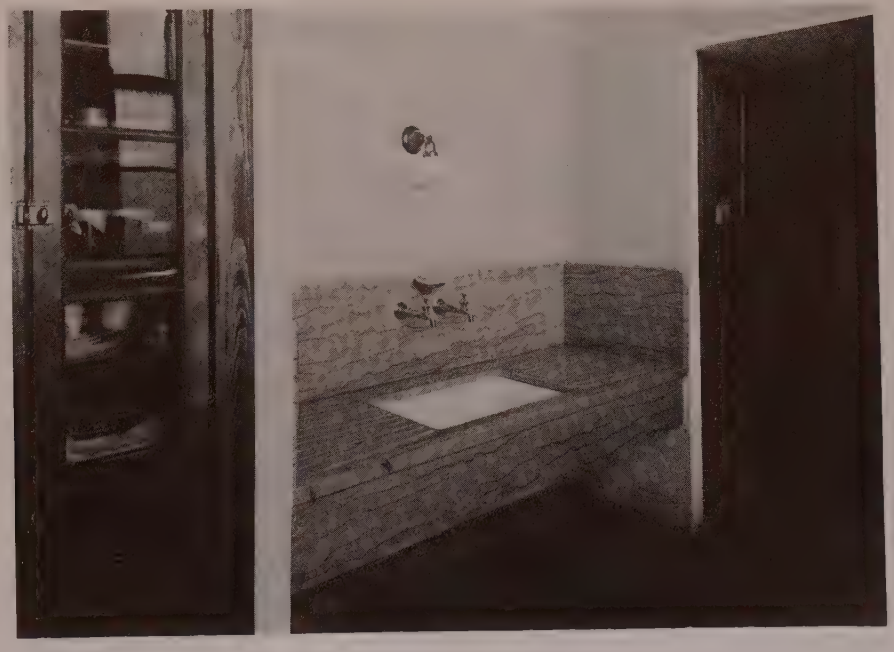
well is now being practiced on the triple ground of beauty, cleanliness and long wear. Of all the materials available, not one has the power, as we have already shown, to suggest luxury as does marble. It is obtainable in countless colors, so that those who object to white marble on account of its cold tone, have a wide range of colors from which to select the treatment that pleases them best. "For so delightfully decorative is marble in its myriads of new phases and lights and shades, that the black and gold of a marble table top in a modest little hallway . . . the shining cleanliness of a marble window sill in a jolly little kitchen . . . the grace of a glowing sundial near a loved garden spot . . . the quiet of a marble mantel sheltering fireside memories . . . the charming 'old-fashioned' marble-topped dresser made new by lovers of beauty . . . the delight of a marble bath . . . the charm of a marble radiator shield in a sunny breakfast room . . . the slightest touch of marble lends an atmosphere of luxury and grace where there was but beauty."

It is impervious to germs and stains, enjoying in this respect a unique advantage among building materials. This inherent cleanliness naturally suggests it as a material for the kitchen, as tiling for the floors, as the top for the kitchen table, or for the sink and drain board. Kitchen walls, so susceptible at all times to the flying grease and the dirt spots inevitably associated with culinary operations, are readily cleaned with soap and warm water when they are lined with marble. A bathroom wainscoted in marble to the ceiling, or even to a height of 4 or 5 feet, is always clean, cool and inviting.

For the sun parlor, a marble floor is

This bathroom of Italian marble was built for a Baltimore residence 20 years ago. It is in flawless condition today.

What could be more inviting than this shower bath of marble?



The acme of cleanliness and durability—a kitchen sink of marble.

A graceful garden seat of Tennessee marble, with carvings of tulips on the ends.

bright and cheery—and delightfully attractive in winter and summer. There is no danger of having its surface marred by the untimely entry of wind-blown rain through a casement window inadvertently left open. A marble vase, a delicate bit of marble statuary or the more elaborate marble fountains set off by a bank of greenery, give an atmosphere of luxury to the modest home. Just as a very small diamond lends value to a piece of jewelry, so even the merest touch of marble, at a very little additional cost, greatly enhances the value of property.

The small garden is made more pretentious by a marble drinking fountain, a bird bath or a bench—or even perhaps a sundial. Marble here is the necessary material whenever there is need for that elusive something that makes the setting of the home stand apart as distinctive and enduring asset to the house itself.

Even the first cost of marble is not prohibitive. When, in addition, one takes into consideration its lasting qualities and its low up-keep cost, this material stands out as one of the least expensive and one of the most satisfactory at the command of the architect or the builder.

While imitations galore are constantly making their appearance, marble is never in any danger of being displaced from its position as the favored medium for quality construction work, because no imitation is capable of being compared with this product of nature's perfect workshop. "For marble is never a 'copy'—it is always an 'original'—ancient as the old, old hills—tinted by a thousand suns—mellowed by wind and time."

A LIST OF THE WORLD'S MARBLES

By J. J. McCLYMONT

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

GROUP A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

GROUP B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

GROUP C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

GROUP D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

Petit Antique or Petit-Antique d'Hechettes.
Same as Hechettes.

Petit Deuil
Quarried at Moulis, Ariege, France.
White with fine black veins. (Blagrove.)

Petit Granit
Quarries at Perlonjour and Mons, Hainault, Belgium.
Dark gray, nearly black, spotted with small fossils.
Takes medium polish.
Many marbles containing small white fossils are called Petit Granite.

Petitor Marbles or Babicombe.
Quarried at Petitor, St. Mary's Church, Devonshire, England.
Petitor Clouded Fossil or Fossil Clouded Petitor is pink and red largely made up of fossils.
Petitor Clouded Gray or Gray Clouded Petitor is gray with numerous small red veins at all angles.
Petitor Clouded Yellow or Yellow Clouded Petitor, yellow with numerous small pink veins at all angles.
Petitor Red or Red Petitor, mottled red and pink with numerous fossils.

Petrified Wood
Found in various places, the best known of which is the so-called Fossil Forest near Corriza, Apache County, Arizona.
According to Merrill, wood is not infrequently fossilized by silica, the organic matter being replaced atom by atom by the siliceous matter until a more or less complete cast of the woody structure remains. This is often variously colored, mainly in red tints by iron oxides and when cut and polished is very beautiful. The great toughness of the material renders it very expensive to work.

Petworth
Same as Sussex.

Peyrere—See Le Peyrere.

Peysonnier

Quarried at Isere, France.
Mottled gray, black and white. (Blagrove.)

Pezenas (*Breche*)

Quarried near Pezenas, Herault, France.
White, gray and green. (Blagrove.)

Phenix

Village on the S. L. & S. F. Company's Railroad, 23 miles from Springfield, Missouri, where Napoleon Gray is quarried.

Phigaleian Marbles

According to Hull this refers to a collection of marbles now in the British Museum, which are evidently modelled after the sculptures of the Parthenon.

Philippeville (Ancient)

Quarried near Philippeville, Algiers, Africa.
Some writers claim that this marble is the same as the Ancient Numidian, while others claim the Ancient Numidian was quarried at Simittu Colonia (Modern Chemtou) in the Valley of Medjerda.
However, this marble is almost, if not identically, the same as Numidian Yellow.

Philippeville (*Light*) or Florence.

Quarried at Philippeville, Belgium.
Gray with irregular spots of varying shades of gray.

Philippeville (*Reddish*) or Florence.

Quarried at Philippeville, Belgium.
Reddish-gray with spots of dark gray and black.

Philippine Islands—See Romblon.

Phillipsburg—See Missouri marbles.

Phonolite or Clinkstone.

Defined by Hull as, "A compact base, in its fresh state dark greenish-gray, showing here and there single cleavage surfaces of vitreous felspar."

Phrygian or Phrygio, or Phrygium.

Same as Synnadic.

Piastraccia

Quarried at Pietrasanta, Italy.
White statuary with broken gray veins or greenish-gray.
Takes high polish.

Picchiettato

Same as Giallo Antico Picchienttato.

Pichens County—See Georgia marbles.

Pidichiasa

Quarried near Trapani, Sicily.
Red with spots of golden yellow. (Blagrove.)

Piedmont

This Italian province produces Candoglio Veine Dore, and other marbles and onyx.

Piedra de Ijada (*Colic Stone*) or Lapis Nephriticus, Fan-yu, Han-yu, Tseng-yu, which are names given to Jade or products from Jade.

Pieds de Souris (Mouse's Feet)

Quarried at Montigny-Saint-Christophe, Hainaut, Belgium.

Gray, spotted with paler gray and with little white marks. (Blagrove.)

Pierra de Paragone or Lapis Lydius

According to Pullen: "This is said to come from Lydia and to be the touchstone of metallurgists. Jet ebony black with faint streaks of mottled white."

Pierra Chaline

Same as Lumachelle des Argonne.

Pierre Champville

Same as Champville.

Pierre D'Ancy Le France—See Ancy Le Franc.

Pierre De Caen—See Caen Stone, French.

Pierre De Chassis—See Marbre De Cassis.

Pierre De Chiampo—See Chiampo (Tavernelle).

Pierre De Comblachien

Same as Comblanchien.

Pierre De Hauteville—See Hauteville.

Pierre De Normandoux

Quarried in France.

White limestone very densely grained. (C. D. Jackson.)

Pierre De Tavernelle—See Chiampo.

Pierre d'Etoile

Same as Pietra Stellaria.

Pietra

Stone.

Pietra Arenaria

Sandstone.

Pietra Calcarea

Limestone.

Pietra di Labradore

Found on the small Island of St. Paul, off the coast of Labrador.

Stone by this name from above source has been classed as an agate by some writers, notwithstanding that it is chiefly composed of Feldspar.

See Labradorite.

Pietra Lavezzaria or Pietra Lavezzaria Serpentine—See Genova Green.

Pietra Nefritica or Lapis Aequipondus.

This ancient serpentine from unknown source, according to Pullen, is usually found in the form of a flattened sphere or a kidney shaped bean (hence the name). Not used to any extent as a building stone, but was used by the Romans as a standard of weights. "They were also used to tie around the necks of Christians condemned to be thrown into wells, or waterways, hence, by some they are known as Martyr Stone.

"Color is jet black, minutely dusted with gray, metallic texture."

Pietra Nefritica Bronzina

Dark metallic brown with suspicion of dusty gray.

Pietra Nefritica Bruna
Dusky brown, metallic spots barely visible.

Pietra Nefritica Nera
Jet black.

Pietra Nefritica Verde
Dark green, with tiny spots of lighter hue.

Pietra Paisina—See Landscape marble.

Pietrasanta—See Piastraccia.

Pietra Stellaria (Madrepore)
Quarried near Verona, Italy.
Gray and white fossils and fragments compose the entire mass.
Takes good polish. (Blagrove.)

Pieva—See Brocatello Della Pieva.

Piggs Peak Mines—See Verdite.

Pikes Peak Quarries—See Amazonite.

Pillora del Fiume
Quarry located near the banks of the Arno, Italy.
Yellow with black veins. (Blagrove.)

Pillora di Arno
Quarry located near the banks of the Arno, Italy.
Greenish-yellow with pinkish veins and black specks. (Blagrove.)

Pinheiro—See Pero Pinheiro.

Pink Alabaster—See Alabaster, Welsh, which is known as Pink Alabaster or Pink Welsh Alabaster.

Pinka Grenna or Irish White
Streamstown Quarries, near Clifden, Galway County, Ireland.
White, slightly tinted with pink and green.

Pink Beltor or Pink Little Beltor—See Little Beltor (Pink).

Pink Clouded
Bancroft Quarries, South Ontario, Canada.
Light pink with numerous white veins and a few light green patches.

Pink Lepanto—See Lepanto.

Pink Listavena
Quarried at West Rutland, Vermont.
White shading to pink faintly veined with green parallel bands, limited supply.

Pink Makrana
Makrana Quarries, Parbatsar District, Jodhpur, Rajputana, India.
Pink with few black and white spots.

Pink Marquise—See Marquise.

Pink Numidian—See Numidian Pink.

Pink Rubio—Group B.
Quarried at West Rutland, Vermont.
Pinkish-white, slightly variegated.
Takes fair polish.

Pink Skye
Same as Skye (Pink).

Pink Sudanese—See Sudanese Marbles.

THROVGH THE AGES

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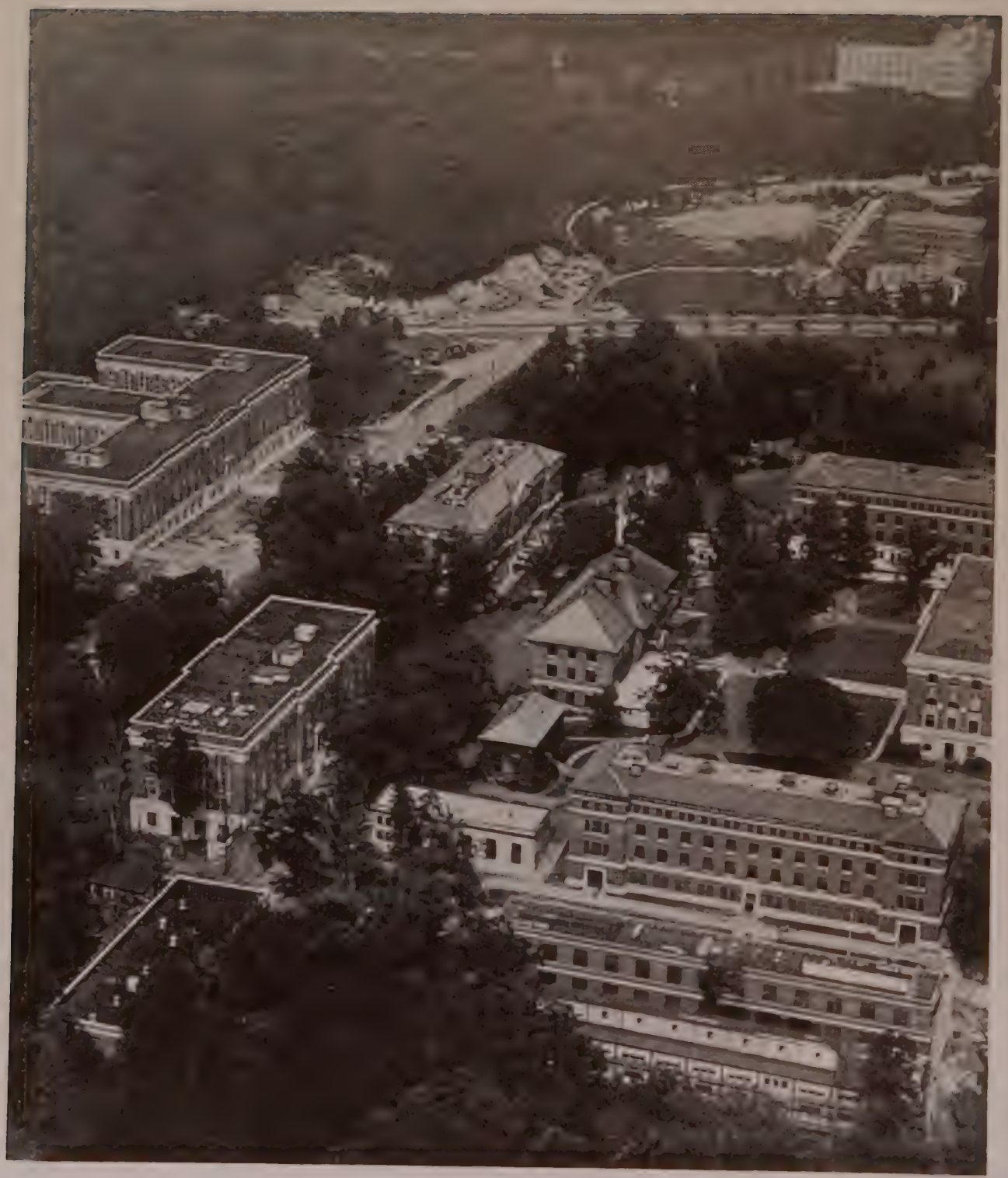

Airplane view of the United States Bureau of Standards, in Washington, D.C.
The research work on marble is being done in the Industrial
Building, shown on the extreme left of the picture.

THROVGH THE AGES

A Monthly Magazine devoted to the uses of Marble - its universal adaptability, beauty, permanency and economy.

VOL. 3 APRIL, 1926 NO. 12

CLEANING MATERIALS FOR MARBLE

A Study of the Results Obtained With Preparations of the Scouring Type

By D. W. KESSLER

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PART II

IN considering the possible injurious effects of trade cleaning materials on marble, one question which appears to be of considerable importance is the expansive force exerted within the pores of the marble when the soluble portion of such preparations penetrates and crystallizes. It has been shown by experiments discussed in the February number of THROVGH THE AGES that practically any salt solution, when allowed to penetrate the marble and crystallize within the pores or minute strain cracks in considerable quantities, exerts a force sufficient to cause spalling of the surface. This, together with a few cases which have come to notice where floors have spalled in a similar way, leads to the belief that in the usual course of scrubbing the same action may occur. Since such cases are unusual, it must be assumed that this action becomes prominent only under certain conditions. However, if it does take place it is more apt to manifest itself in the more costly buildings because these are usually cleaned frequently. Hence it is desirable to recognize and eliminate as far as practicable all such sources of trouble.

In the study of this problem the means adopted is to compare certain physical properties of the marble after a prolonged period of scrubbing with the same properties of the original material. Sample slabs of marble were cut into test specimens as shown in Figure 1. Numbers 2 and 4 of these are tested for strength and elasticity in the original condition, while Numbers 1, 3 and 5 are scrubbed 120 times with the cleaning material under consideration. The scrubbing is done on the scrubbing machine previously described, which tests thirty-six such specimens simultaneously. The period between successive scrubbings of each specimen is six hours, which is to allow the marble to become dry in order that crystallization will be induced. After 1, 3 and 5 are scrubbed, all five specimens are submitted to flexure tests by supporting them on two cast-iron knife edges as shown in Figure 2 and loading by means of a similar knife edge at the center. Loads are applied in 10-pound

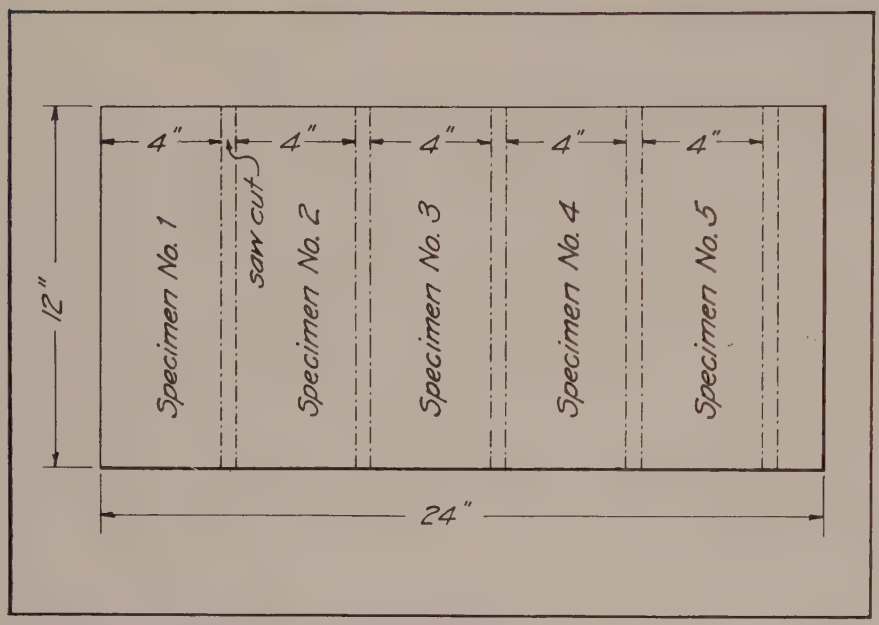


FIGURE 1—Method of cutting and numbering specimens. Original slab was 12 by 24 inches, of stock thickness, which generally varies from 0.7 to 0.9 inch.

increments and the bending at the center due to each fifty pounds of load is measured. The deflections corresponding to various loads plotted to a convenient scale, as in Figures 3 and 4, indicate that in most cases a few points at least lie in a straight line. Where the points fall below the straight line (*i.e.*, where the line begins to curve) is called the "yield point," which indicates that the specimen is bending faster due to the increasing load. The load is increased until the specimen breaks. From the breaking load the transverse strength of the specimen is computed by means of the formula $M = \frac{3wl}{2bt^2}$ in which W is the breaking load, l, b and t are the distance between supporting knife edges, breadth and thickness of specimen respectively. The slope of the straight portion of the line enables one to compute the modulus of elasticity, which is done by means of the formula $E = \frac{w}{d} \times \frac{l^3}{4bt^3}$, in which all the symbols have the same meaning as above except that W is the load ordinate of the point corresponding to any convenient deflection d (*i.e.*, W ÷ d is the slope of the straight portion of the elastic curve). The strength, elasticity and yield points of numerous specimens have been determined in this way for comparing these properties of the marble after scrubbing

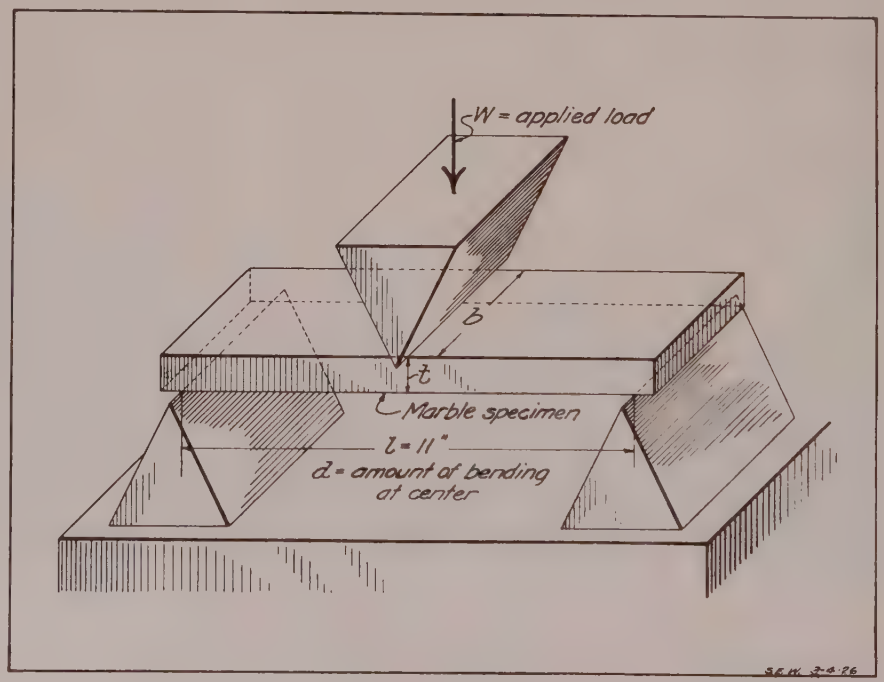


FIGURE 2—Method of testing slabs for strength, elasticity and yield point.

TABLE SHOWING TRANSVERSE STRENGTH, ELASTICITY AND YIELD POINT OF VARIOUS MARBLES IN THE ORIGINAL CONDITION AND ALSO AFTER 120 SCRUBBINGS WITH A TRADE CLEANER.

Marble	Transverse Strength (Pound Per Square Inch)		Modulus of Elasticity		Yield Point (Pound Per Square Inch)	
	Original	After Scrubbing	Original	After Scrubbing	Original	After Scrubbing
M 1	2,700	2,300	9,700,000	6,600,000	2,000	1,400
M 2	2,400	1,900	6,300,000	5,500,000	900	1,000
M 3	2,300	2,200	11,500,000	11,400,000	2,000	2,000
M 4	500	700	....	....	....	....
M 5	1,200	1,100	1,900,000	2,000,000	500	500
M 6	900	800	5,100,000	5,000,000	600	600
M 7	1,300	1,200	9,000,000	10,000,000	900	700
M 8	2,800	2,400	11,100,000	11,200,000	2,300	1,600
M 9	1,700	1,500	6,100,000	6,100,000	600	500
M10	1,600	1,400	11,300,000	10,400,000	700	800
M11	500	600	2,400,000	2,400,000	200	200
M12	2,100	2,000	9,300,000	9,800,000	2,200	1,600
Average	1,667	1,508	7,609,000	7,309,000	1,188	992

Average decrease in Strength=9.5 per cent; average decrease in Elasticity Modulus=3.9 per cent, average decrease in Yield Point=14.1 per cent.

Transverse strength, elasticity and yield point of various marbles in the original condition and after 120 scrubbings with a trade cleaner. Each value is the average of from two to three tests.

with the same properties of the original samples. The tabulation shows the results for a test on a widely used cleaning material of the tri-sodium phosphate type.

Twelve marbles which were selected to represent the various types were scrubbed with this material. It will be noted from these results that there was usually a decrease of strength indicated on the scrubbed specimens, that the elastic moduli showed a rather indefinite trend, and that the yield points were considerably lower for the scrubbed material. In order to eliminate, as far as possible, the inconsistencies due to the natural variations in the marble it is necessary to consider the average of several tests. Each column in this table has been averaged for this purpose and a comparison of these mean values indicates a loss of strength of about 10 per cent, a decrease in the elastic modulus of nearly 4 per cent and a drop in the yield point of over 16 per cent.

To interpret the significance of these results in terms of practical usage it is necessary to consider what period of service conditions to which the scrubbing test is equivalent. In cases where the marble is scrubbed only once a year, as is frequently the case in wall work, evidently no appreciable effect from crystallization would ever be noticeable. On the other hand there are many buildings in which the floors are scrubbed every day. In such cases it is probably fair to say that a year or two of service would give the same results as indicated by the tests and ten or twenty years would cause some disintegration.

One case can be cited where a marble floor, which is scrubbed each day with a cleaning material containing a rather high percentage of soluble salt, is blistering at the surface. This building is about twenty years old. Another case has been observed in which some solid marble steps have

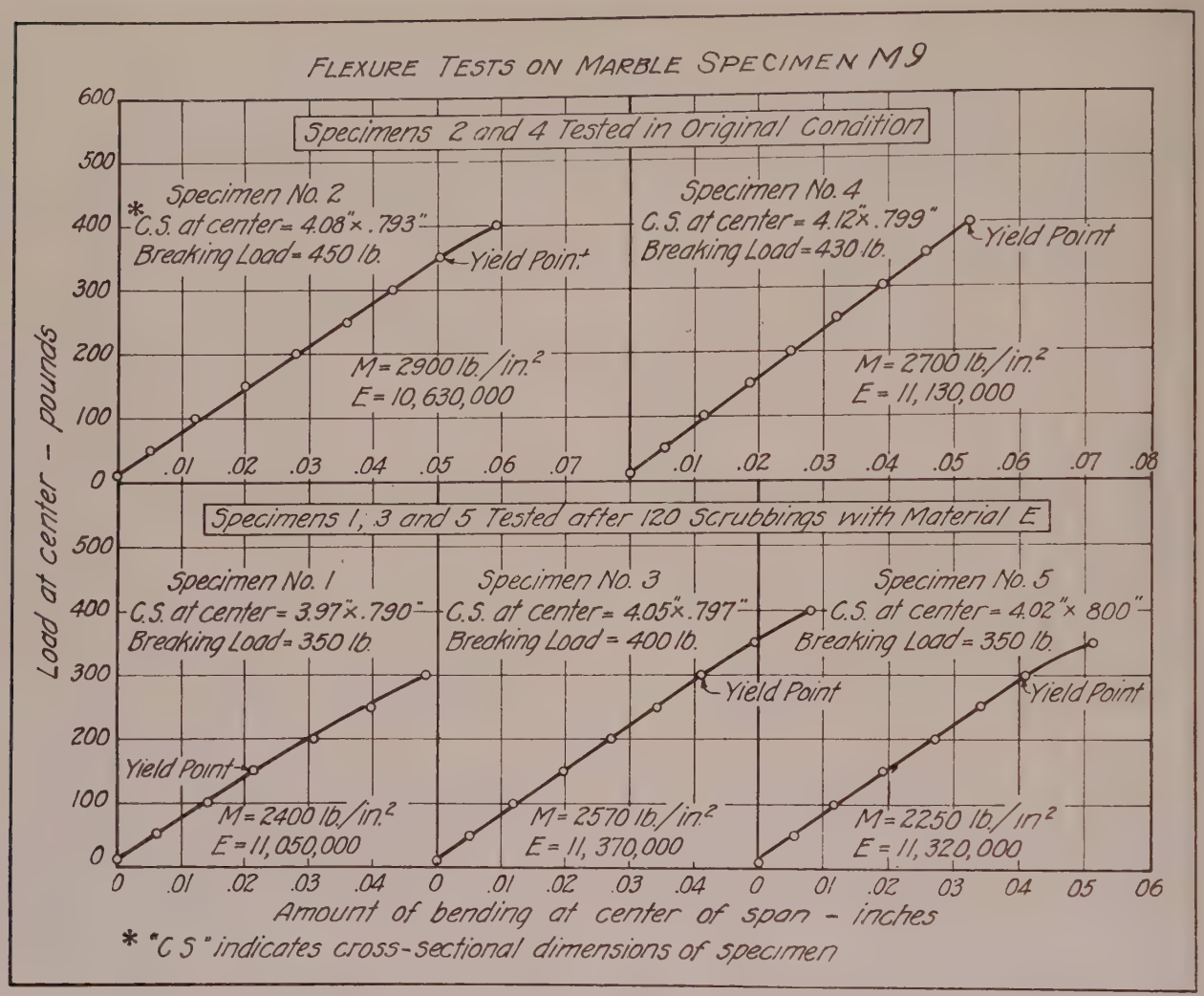

FLEXURE TESTS ON MARBLE SPECIMEN M9
Specimens 2 and 4 Tested in Original Condition
Specimen No. 2
*C.S. at center = 4.08" x .793"
Breaking Load = 450 lb.
Yield Point
M = 2900 lb./in.²
E = 10,630,000
Specimen No. 4
C.S. at center = 4.12" x .799"
Breaking Load = 430 lb.
Yield Point
M = 2700 lb./in.²
E = 11,130,000
Specimens 1, 3 and 5 Tested after 120 Scrubbings with Material E
Specimen No. 1
C.S. at center = 3.97" x .790"
Breaking Load = 350 lb.
Yield Point
M = 2400 lb./in.²
E = 11,050,000
Specimen No. 3
C.S. at center = 4.05" x .797"
Breaking Load = 400 lb.
Yield Point
M = 2570 lb./in.²
E = 11,370,000
Specimen No. 5
C.S. at center = 4.02" x .800"
Breaking Load = 350 lb.
Yield Point
M = 2250 lb./in.²
E = 11,320,000
Load at center - pounds
Amount of bending at center of span - inches
* "C S" indicates cross-sectional dimensions of specimen

FIGURE 3—Complete set of comparative tests on marble M9 in original condition and after scrubbing.

scaled to an appreciable extent on the riser face, which appears to be due to penetration of salts. Observations of the marble work in buildings for the purpose of studying this question have been limited and of a random nature. Perhaps a systematic study of numerous cases would reveal several such examples. Even with the present results the evidence seems strong enough to justify a limitation of the soluble salts in cleaning preparations.

In cleaners of the scouring type these soluble salts are used partly for their water softening value and partly for the detergent effect. However, soda ash or sodium bicarbonate do not remove all the hardness from the usual type of city water, and the amount necessary to accomplish the possible softening by these salts is very small. An examination of the available data on city water supplies shows that the hardest waters are found in the middle west. As an example of a hard water which may be expected to cause trouble in cleaning operations unless it is treated, the case of Omaha may be cited. The following analysis of this water is

taken from Water Supply Paper 496 of the U. S. Geological Survey. The figures are on the basis of parts per million.

Total dissolved solids	663
Silica (SiO_2)	76
Iron (Fe)	2
Calcium (Ca)	102
Magnesium (Mg)	38
Sodium and Potassium (Na+K)	72
Bicarbonate Radicle (HCO_3)	337
Sulphate Radicle (SO_4)	237
Chloride Radicle (Cl)	15
Nitrate Radicle (NO_3)	5.5

The elements in this water which would prove troublesome are: iron, calcium and magnesium. All of these would precipitate soap from solution forming insoluble soaps which are of a waxy nature. Such compounds stick to the surface of marble and are very difficult to remove by rinsing. The iron soap is brown and would slowly impart its color to light colored marbles. Complete softening in such cases can be accomplished by adding lime and soda ash in such small amounts as 1 or 2 ounces of each per barrel of water. A small softening plant may easily

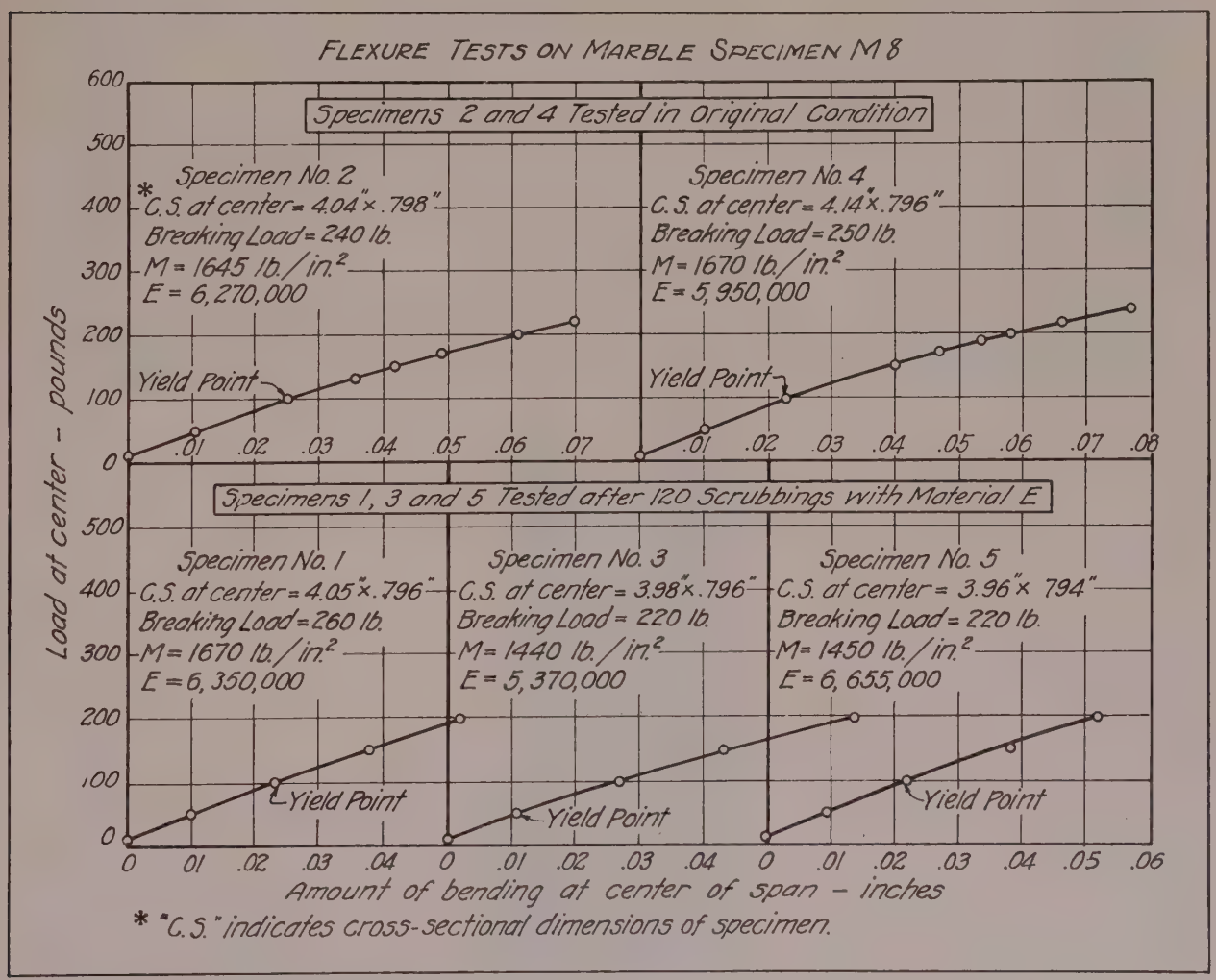

FLEXURE TESTS ON MARBLE SPECIMEN M 8
Specimens 2 and 4 Tested in Original Condition
Specimen No. 2
*C.S. at center = 4.04" x .798"
Breaking Load = 240 lb.
M = 1645 lb./in.²
E = 6,270,000
Yield Point
Specimen No. 4
C.S. at center = 4.14" x .796"
Breaking Load = 250 lb.
M = 1670 lb./in.²
E = 5,950,000
Yield Point
Specimens 1, 3 and 5 Tested after 120 Scrubbings with Material E
Specimen No. 1
C.S. at center = 4.05" x .796"
Breaking Load = 260 lb.
M = 1670 lb./in.²
E = 6,350,000
Yield Point
Specimen No. 3
C.S. at center = 3.98" x .796"
Breaking Load = 220 lb.
M = 1440 lb./in.²
E = 5,370,000
Yield Point
Specimen No. 5
C.S. at center = 3.96" x .794"
Breaking Load = 220 lb.
M = 1450 lb./in.²
E = 6,655,000
Yield Point
Load at center - pounds
Amount of bending at center of span - inches
* "C.S." indicates cross-sectional dimensions of specimen.

FIGURE 4—Complete set of comparative tests on marble M8 in original condition and after scrubbing.

be installed at some convenient place in the building or on each floor. All that is necessary is a barrel or small tank with two spigots, one at the lowest point for removing the sediments and another 2 or 3 inches higher for drawing off the clear water. The water should be treated twenty-four hours or so before use in order to give the precipitates time to settle.

A convenient way to obtain a thorough incorporation of the softening elements is to put them in the barrel before filling, then let in the water from some point near the top to produce agitation of the mixture. Where it is not practical to soften the water as suggested above, a fairly satisfactory means is to add soda ash or tri-sodium phosphate and household ammonia to each pail of water before using with soap. About one half teaspoonful of either the phosphate or soda ash and one teaspoonful of ammonia water to each pail of water will usually remove the principal hardening elements.

Where important marble installations are frequently cleaned it seems advisable to soften the water and then rely mainly on soap as the detergent, or, in the case of floors, soap with a mild scouring agent. When powdered soap and the water softening agent are both put into water at the same time, as is the case with several trade cleaners, there is danger of forming an appreciable amount of insoluble soap before the softener has fully acted. The complaint frequently made that soap produces a dull waxlike appearance when used to clean marble is probably due to hardness in the water used, which produces an insoluble soap that is not removed from the surface in the ordinary rinsing process.

Marble urn in Hotel Washington, Washington, D C.

Mural tablet in Baker residence at Glen Cove, Long Island; Walker & Gillette, architects.
Carved out of Rutland Statuary marble.

THE EVOLUTION OF THE MARBLE CARVER

WHEN prehistoric man discovered that he could vastly augment his physical powers with the aid of sticks and stones so plentifully strewn about him, the way was opened for the development of the multitudinous arts and crafts pursued by later civilizations. The human race in a clumsy way had started putting to its service the hidden forces of nature. Even after finding it possible to do damage at a distance with a hurled rock or club, a long period of time must have elapsed before someone chanced to tie a stone on the end of a stick and to realize that, with the combination of the two, he possessed a weapon far superior in effectiveness to anything used heretofore. From that time, and with the help of such crude tools, new avenues of unsuspected power were opened and the human race slowly developed the trait of constructive thought.

As new experiences came to him, man felt the urge to tell them to his comrades. Perhaps with the aid of his stone hammer

Carving the cap for the Soldiers' Memorial, Stamford, Connecticut, in the shops at Proctor, Vermont. George A. Freeman, architect.

he had conquered a fierce beast never overcome before. Such a feat would give him unquestioned distinction in the tribe. Therefore it became necessary to translate his adventures in a manner intelligible to his fellow beings. Accordingly, the savage hero may have resorted to a stretch of smooth sand where he could mark for all to see the graphic story of his struggle.

But the sands were not permanent. A little gust of wind, a sudden shower, would quickly obliterate the pictured tale; and man's mind would not retain it much longer. A more lasting method of depicting his narrative was necessary. The inevitable result was at first to scratch, and later to chisel crudely his legends on the walls of caves and other exposed rock surfaces. A few of these records engraved on pieces of stone or ivory have been discovered and carefully preserved.

Since those times art in its various forms has been used universally to express human emotions. The ancients symbolized their worship in the form of sculptured deities. Stone carving had its principal development

in the service of religion. In pagan times temples and fanes to the fabled gods called for more elaborate adornment than was given to palaces of earthly beings. Some races conceived their deities as monsters, the carved objects representing them standing stiff and unreal. Others thought of their gods and goddesses in the likeness of human beings, but humans freed from every blemish, made beautiful by the artistic imagination. From such ideals sprang some of the finest examples of sculptured art the world has ever seen.

Greek sculpture owes its fame to the idealism of its craftsmen. The rôle of the Greek sculptor was inspiring and elevating. His work, exhibited to sympathetic and intelligent multitudes, appealed to the highest and best in their natures. Unlike the modern artist who first makes a clay model and then has it duplicated in marble, the Greek master carved the whole subject personally. With the help possibly of drawings or small clay models to guide the eye, he dispensed with measurements and struck out freely as genius and training inspired him. If he made a mistake the result was remedied by attaching a fresh piece of mar-

Figure for Stewart Memorial Fountain at Madison, Wisconsin. Sculptured from Vermont Statuary marble from models by Frederick C. Clasgens.

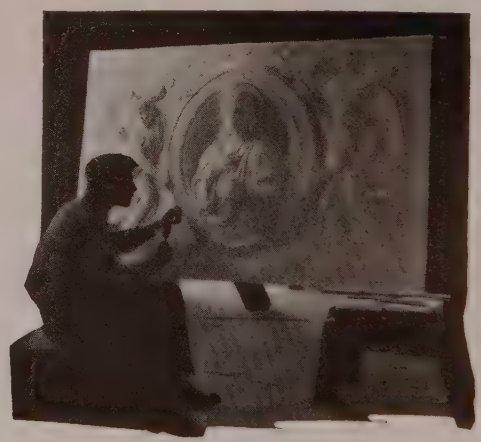
Cutting the large sculptured capitals, from blocks of Vermont marble, for the Arlington Memorial columns.
Carrere & Hastings, architects.

ble. The ability to work in this way must have required an astounding accuracy of eye and hand.

The practice of combining several pieces of marble to form a single subject was frequently and skilfully accomplished by the Greeks. F. B. Tarbell, in his "History of Greek Art," states: "A Greek marble statue is often not made of a single piece. Thus the Aphrodite of Melos was made of two principal pieces, the junction coming just above the drapery, while several smaller parts, including the left arm, were made separately and attached. The Laocoön Group which Pliny expressly alleges to have been made of a single block, is in reality made of six. Often the head was made separately from the body, sometimes of a finer quality of marble, and then inserted into a socket prepared for it in the neck of the figure. And very often, when the statue was mainly of a single block, small pieces were attached, sometimes in considerable numbers. Of course, the joining was done with extreme nicety, and would have escaped ordinary observation."

Pierced grille, cut from Napoleon Gray marble, in the Bowery Savings Bank, New York City.

Among the ancient Greeks and Romans, and later in the Mediæval Period, it was customary to give a considerable degree of polish to the nude parts of a marble statue. It was supposed to suggest the somewhat glossy surface of the human skin better than the coarser finish left by modern sculptors. Some of the pedimental figures of the Parthenon still retain this high polish. The Hermes of the Vatican Belvidere is a



Carver at work on marble panel for the altar in the Vincentian Convent, Albany, New York.

Bust of Hippocrates, placed in the Kolynos Building, New Haven, Connecticut. The marble is Vermont Statuary. McClintock & Craig, architects.

remarkable instance. Michelangelo employed this method still further and gave certain parts of some of his statues, such as the Moses, the highest possible polish in order to bring out certain high lights just where he desired them.

Michelangelo, in some instances, appears to have cut his statues from the marble without previously making a model—a mastery of art rivaling that of the ancient Greeks. Like all of the great sculptors of the Middle Ages, he did the whole of the carving with his own hands, and "when beginning on a block of marble attacked it with such vigorous strokes of the hammer that large pieces of marble flew about in every direction."

While producing their wonderful creations, the old craftsmen were not annoyed to any great extent by the problems of competition or of the high cost of living. They thought nothing of waiting months for ox teams to haul blocks from the quarries. Like methods, today, would not be tolerated nor could modern carvers spend such lengths of time in dreamy contemplation of their work as is related of Ghiberti, who consumed twenty years of his life in making those marvelous doors for the Baptistry at Florence. The amount of money received would not support the most meagre standard of living. The modern artist has at his command special machinery to facilitate the production of sculptural work in marble. Hand methods of sawing have almost entirely disappeared, while rubbing and polishing depend largely on machine processes. Workmen are equipped with pneumatic chisels which—except where certain work demands it—have done away with the old hammering methods. Yet with all these changes a high standard of workmanship is constantly maintained. In fact, we find many instances of truly inspiring pieces of sculpture finished with such scrupulous care, such infinite regard for detail, that one marvels at the handiwork.

Carved panel in the wall of the Missouri State Capitol. The architects, Tracy & Swartwout, selected Napoleon Gray marble for this work.

The carved panels in the Brooks Memorial at Memphis, Tennessee, are of Georgia marble. The architect was James Gamble Rogers.

Many an artistic feature of the modern altar owes its origin to one of the old creations. A noteworthy instance is the sculptured picture of the "Last Supper" which rests in the altar of St. James Cathedral, Seattle, Washington. It is a faithful transcription in stone of the original painting by Leonardo da Vinci. Its white marble figures eloquently portray the story as told by the inspired brush of Leonardo. The vigor and delicacy of the work in this panel is apparent to the most casual observer. It is a notable achievement in the art of marble carving in America.

With the development of taste and the growing elaboration of buildings, there has been a very great increase in the employment of ornamentation in stonework. Within the past decade or two there have been erected in this country countless structures, both public and private, that can scarcely be matched in any country for size, elaborateness, and cost. Sculpture has been called in as an aid to architecture and it is the exception, rather than the rule, when an important building goes up without a plentiful enrichment of carving, if not of actual statuary. A rather unique example

may be found in the Book Building, Detroit, Michigan, particularly in the engaged columns which divide the third story windows into three parts. These white Vermont marble pillars are replicas of the historical shafts in the Certosa di Pavia, built during the latter part of the fifteenth century. The sculptured freize above each opening is another telling detail in the success with which Louis Kamper has applied the artistry of the Italian Renaissance to the requirements of modern building construction.

In the mantel of the State Library at Albany, N.Y., is an interesting piece of interior decoration — the New York State Seal, carved from a slab of white marble and showing in artistic detail the various characters and symbols. It is a very appropriate addition to the attractive fireplace in the library. In the same line with this seal there is the Wall Tablet in the Baker residence, Glen Cove, Long Island, N.Y., which shows, in relief, an old-time ship under full sail, driven before the wind. Adornments like these bring individuality and character to an interior.

The custom of appropriating marble to the needs of parks and gardens was inaugurated many centuries ago by the

White Georgia marble was used in the Dupont Memorial Fountain at Washington, D.C. Henry Bacon was the architect and Daniel Chester French the sculptor.

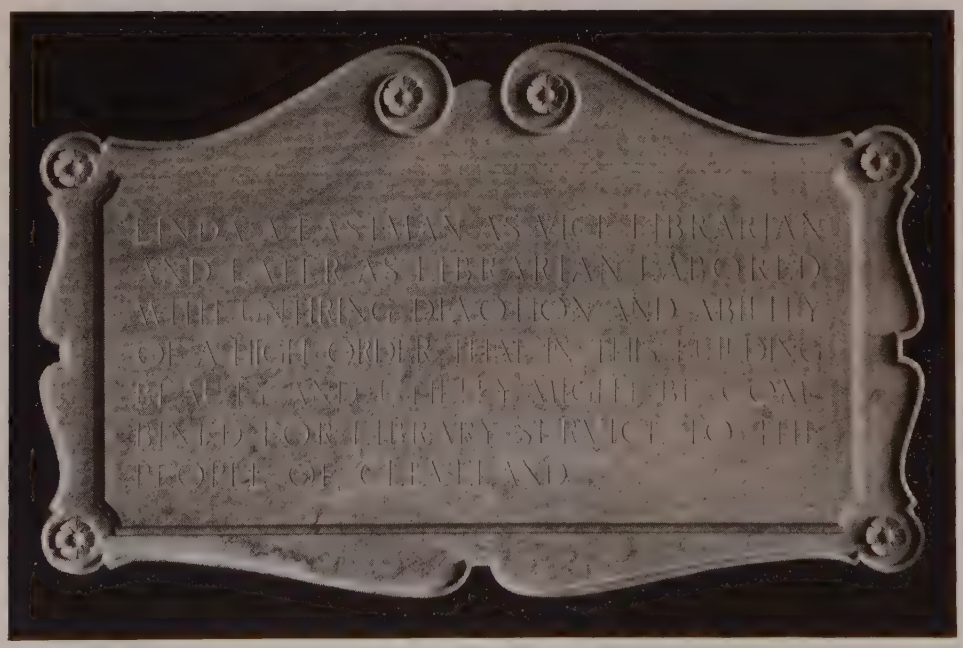
wealthy families of the Old World. This practice, coming to us across the ages, has lost nothing of its popularity. Everywhere in our parks and gardens there are evidences of fine sculptured work in marble. In Roger Williams Park, Providence, R.I., Benedict's Monument to Music, with its turned Ionic capitals, is embellished further with a beautifully carved frieze. Another memorial within this category is the Stewart Memorial Fountain, Madison, Wisconsin, which exhibits some very skillfully executed marble figures. Still another is the Dupont Memorial Fountain in Washington, D.C., by Daniel Chester French, one of the ablest of American sculptors. This was built of white Georgia marble and it is said that the pedestal was cut from a single block 10 feet high and the bowl from a block 13 feet in diameter.

On a smaller scale are the wall tablets, such as that to Linda A. Eastman in the Cleveland Public Library, which evidence the high degree of proficiency attained by our marble shops today. Other forms of marble carving are seen in the pierced marble grill in the Bowery Savings Bank, New York, and the carved panel in the wall of the Missouri State Capitol, at Jefferson City. In each of these two instances, Napoleon Gray marble was used; the Cleveland Library tablet was cut out of Eastman Cream marble.

Carved work in marble, whether it is in the form of architectural ornament, fountain or garden group, memorial tablet or statue, always lends an atmosphere of distinction to its setting. It not only imparts color, beauty and attractiveness to the surroundings, but it is ever a source of inspiration to the true craftsman.

Some have eyes
That see not; but in every block of marble
I see a statue—see it as distinctly
As if it stood before me shaped and perfect
In attitude and action. I have only
To hew away the stone walls that imprison
The lovely apparition, and reveal it
To other eyes as mine already see it.

From: *Longfellow's Michelangelo.*



One of the tablets in the Cleveland Public Library.

Hotel de Ville at Loches, begun by Francis I. The twelfth century Picoys gate is at the right.

THE STYLE OF HENRY II

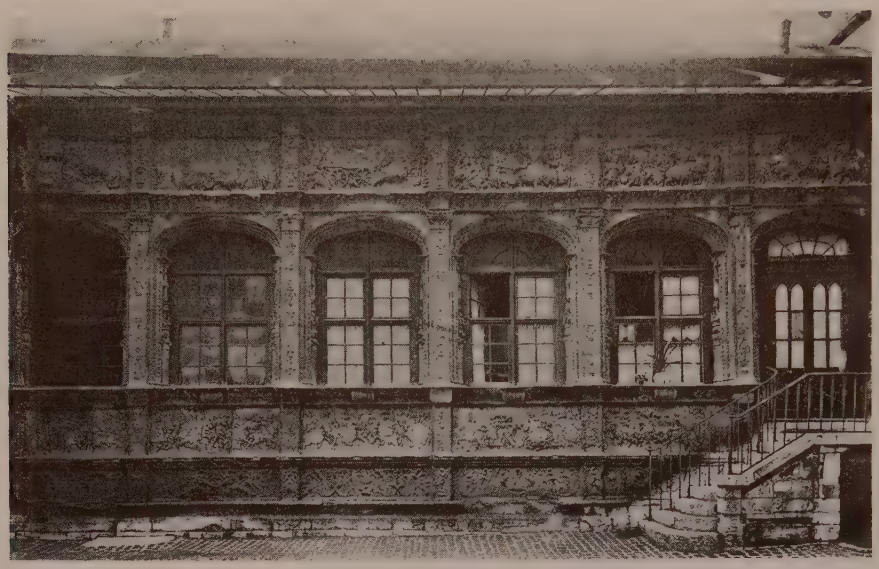
The Period was Distinguished by a More Marked Neo-Classic Regularity and a Further Elimination of Mediaeval Traditions

PART II

IN our last article we discussed briefly the characteristics of the French architects of the middle of the sixteenth century and the chief architectural developments during the last part of the reign of Francis I. The preparatory period is generally regarded as ending with the death of this monarch; the period of the advanced Renaissance that followed, known as the style of Henry II, was distinguished chiefly by the works of the four men mentioned previously: Pierre Lescot, Jean Bullant, Philibert de l'Orme and Jean Goujon. These stood in relation to the French Renaissance just about as Palladio and Vignola stood in relation to the new style in Italy.

Henry II, though of scant intellectual attainments, was a dignified and not un-

Illustrations courtesy Thomas Machen, architect, Baltimore.



Carving on the Hôtel Bourgtheroulde, Rouen.

successful ruler, and under the influence of Diane de Poitiers he liberally patronized literature and the fine arts, and his encouragement was in no small measure responsible for the prolific achievements in prose, poetry, painting, engraving, the plastic arts, typography and scientific research.

Architectural design was distinguished by a more marked neo-classic regularity and symmetry, and a further elimination of mediæval traditions. "Round towers," says Ward, "became the exception, square pavilions the rules. Stairs were more seldom spiral or placed in projecting blocks. The plan of the great house in town or country, envolved during the last two reigns, became fixed. Its buildings, disposed round a rectangular court, may be classified as main blocks, gallery wings, and pavilions. Usually all had a basement story: main blocks, seldom occurring on more than three sides, had two principal stories above this and one in the roof; gallery wings had one principal story, often with a flat roof used as a terrace; pavilions, at the angles and sometimes in the center of a block, square in plan and projecting beyond the general line, were higher by a full story or an attic than the adjoining buildings. The principal apartments were in the main blocks and pavilions. The entrances to them were in connection with the staircases, and the principal one was generally opposite the entrance to the court placed in an open gallery. The closed gallery occupied various positions in the plan. The subsidiary courts which, like

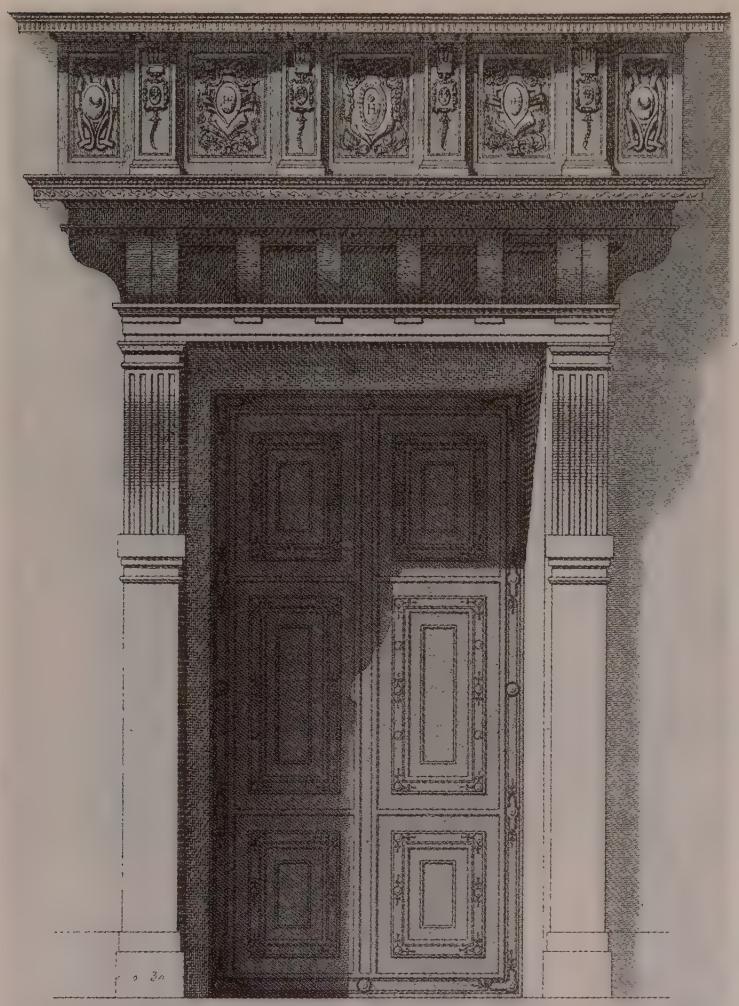
Façade of the Hôtel Bourgtheroulde, Rouen.

The court of the Louvre, in Paris, showing a portion of the west side. Note the elaborate carving and statuary.

the *cour d'honneur*, were rectangular, were grouped round it, a forecourt usually preceding it, with its own gate pavilion generally, but not always, opposite the inner one. Other courts were often added with lower, or at any rate less splendid, buildings than the central one."

The use of the orders increased despite the problem presented by the importance of having low stories and large window openings. In a country where its climate made lofty apartments impractical, and light very welcome, it was necessary in order to preserve the integrity of the order, to invent new schemes. Windows frequently were broken right through the entablature, or their heads were ranged with the architrave or carried up to the cornice. Sometimes the use of a giant order was adopted, in place of a single order to each story. Again, we find the orders confined to only a part of a building, sometimes to its court elevation, sometimes to its central part. Where the orders were dispensed with entirely, vertical divisions were secured by the coigns or the projection of the pavilions, or by the piers between the windows, as in the chateau of Joigny and the Hotel d'Ecoville.

Horizontality was increased by bands of ornaments and continuous entablatures and by stressing the basement story by having it rusticated or battered and capped with a prominent plinth course. The cornice line was broken by emphasizing the dormers and using ranges of pediments. The external use of color was found in fewer instances, though bronze ornaments and marble incrustations were frequently seen. The



Detail of a doorway in the chapel, Château d'Anet, built in 1552.

latter were generally of a dark hue, often black, as in the Petite Galerie of the Louvre and the well-known house at Joigny.

Chief among the works of the time were the Louvre, the palace of the Tuileries, and the chateaux of Verneuil, Chantilly, Ancy-le-Franc and d'Anet. Of these, the Louvre enterprise was to prove the most important in ultimate results. As the seat of the French monarchy, the old fortress had been the scene of many stirring events, but its inadequacy for the royal requirements had become sadly apparent about the time of the contemplated visit of Charles V (1539). Lescot was given the work of reconstruction and the west wing was demolished and the erection of a new palace was begun in 1546.

This was to occupy eventually precisely the same site as the old fortress, forming an almost square court about 175 feet wide, with the entrance at the east and a principal block at the west. The external façades retained the mediæval severity; the court façades were sumptuously ornamented but of a very dignified classic style. The designs of Lescot were chosen, it is said, after a competition in which Serlio took part; it is worth noting that the retention of Lescot as the architect for the crown marked the first time that complete control of a building was ever given over to one man by royalty.

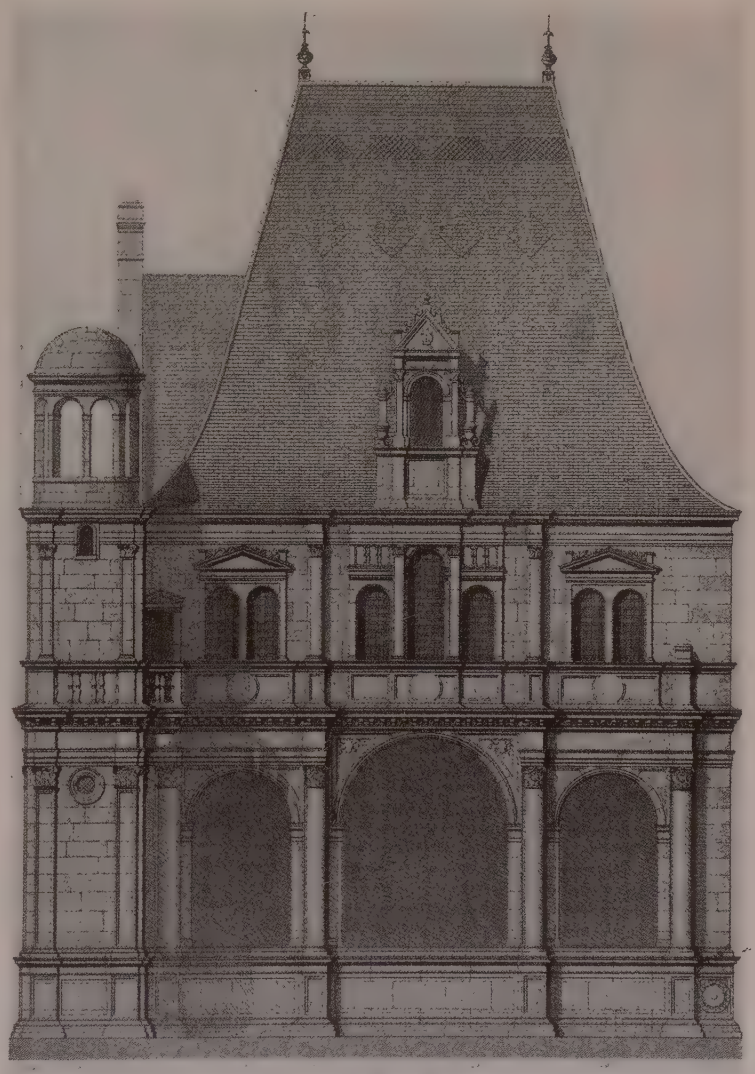
Under Henry II the west wing and one bay of the south wing were built; Henry's sons continued the work as far as the inner side of the proposed southeast pavilion; an enlarged and somewhat different scheme was adopted by later monarchs; and it was not until the last part of the nineteenth century, that the most extensive and beautiful of the royal residences of Europe was completed.

In Lescot's plan the three wings were to have two stories and an attic and the angle pavilion an additional story. The main elevation to the court was divided vertically by emphasis placed on the first, fifth and ninth by the use of double full columns in contrast, with the single pilasters of the intervening portions. The scheme includes two stories and an attic each adorned with a classic order, the Corinthian, the Composite and a panelled pseudo-order respec-

tively, the latter after the manner of the Lombard Renaissance. Only the two principal floors here complete entablatures, the attic having a cornice with a frieze that includes the capitals, and surmounted by a parapet with filigree ornamentation. The elevation is enriched with profuse sculpture largely carried out by Jean Goujon.

In the basement of the Louvre appears certain features that have met with severe criticism from our modern authorities. The arch of the central bay was omitted and a portion of the entablature eliminated. Charles H. Moore, in his "Character of Renaissance Architecture," writes as follows: "This last device, of which, as we have seen, the later Renaissance architecture of Italy affords many instances, is not only a violation of the principles of classic design which these architects were professing to restore, but it is a barbarism, because it breaks the continuity of those lines which in such a composition should have the expression of binding the parts together. In the story above, the entablature is not completely broken; the architrave and frieze only are cut in order to insert a tablet. In the attic, however, the cornice is cut out completely, and a segmental arch is sprung over the opening to form a pediment as a crowning feature of the pavilion. The traditional logic of French design is thus completely ignored by Lescot, and he abandons himself to capricious methods of composition as completely as the Italians had done. It is surprising not only to find the French people thus following the Italians in their irrational misuse of structural forms in ornamentation, but also to find them, after having produced in the Middle Ages the most living and beautiful forms of foliate sculpture that the world has ever seen, resorting to the heavy and formal festoons of decadent Roman art, as Lescot has done in these friezes of the Louvre."

An extravagance of ornamentation similar to the later Roman and Gothic is seen in this period of French Renaissance.



Building in Caen known as the Hôtel d'Etienne Duval, in the style of Henry II.

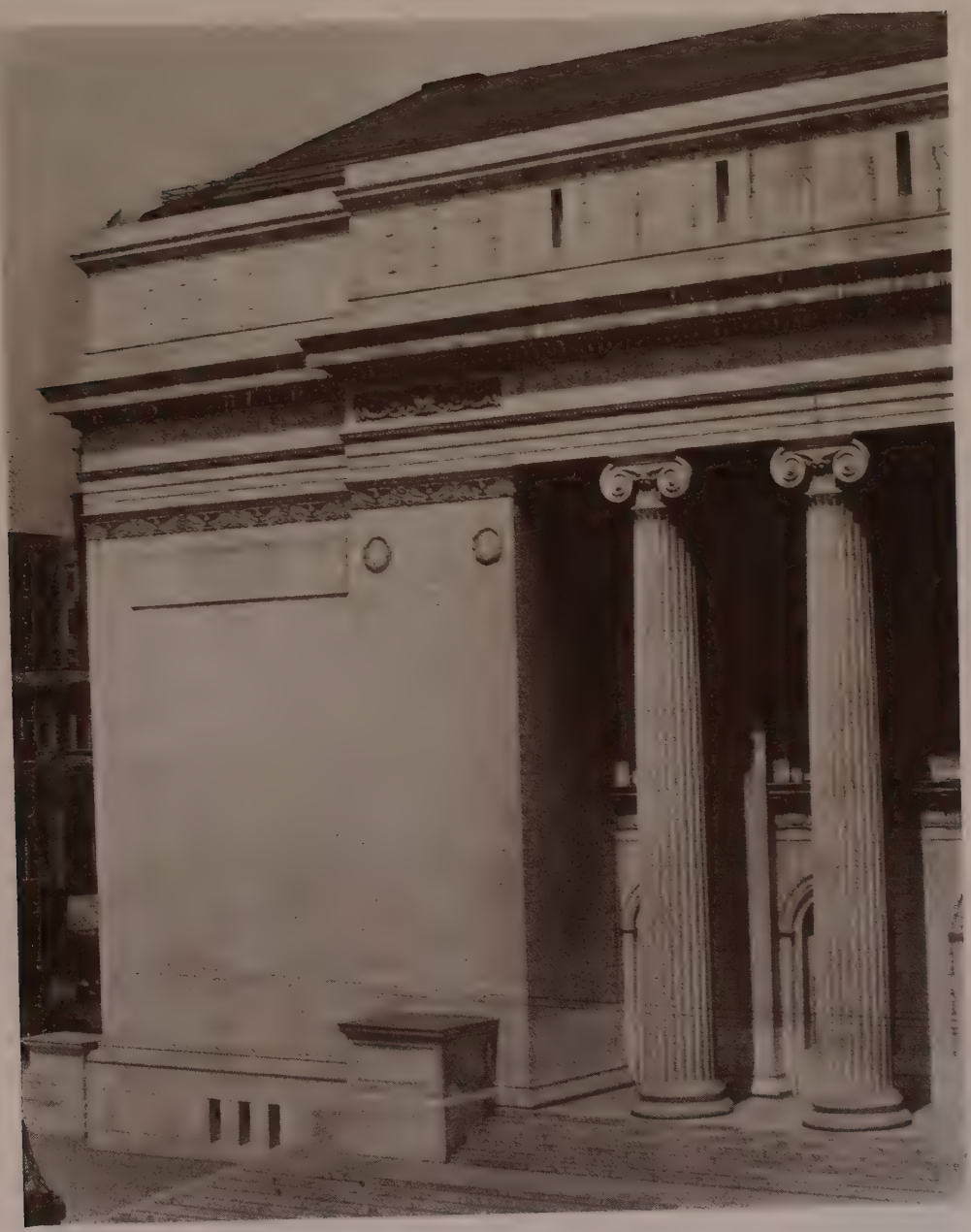
Looking through the Colonnade

THE POST OFFICE AND COURT HOUSE AT DENVER, COLORADO

A Local Marble Was Used For The Exterior

THE Treasury Department, for some unknown reason, has charge of the United States Government public buildings. Back in the spring of 1909, this department invited a number of architects to submit plans in competition for a Post Office in Denver, Colorado. The architect of the Treasury at that time was James

Illustrations courtesy *The Architectural Record*



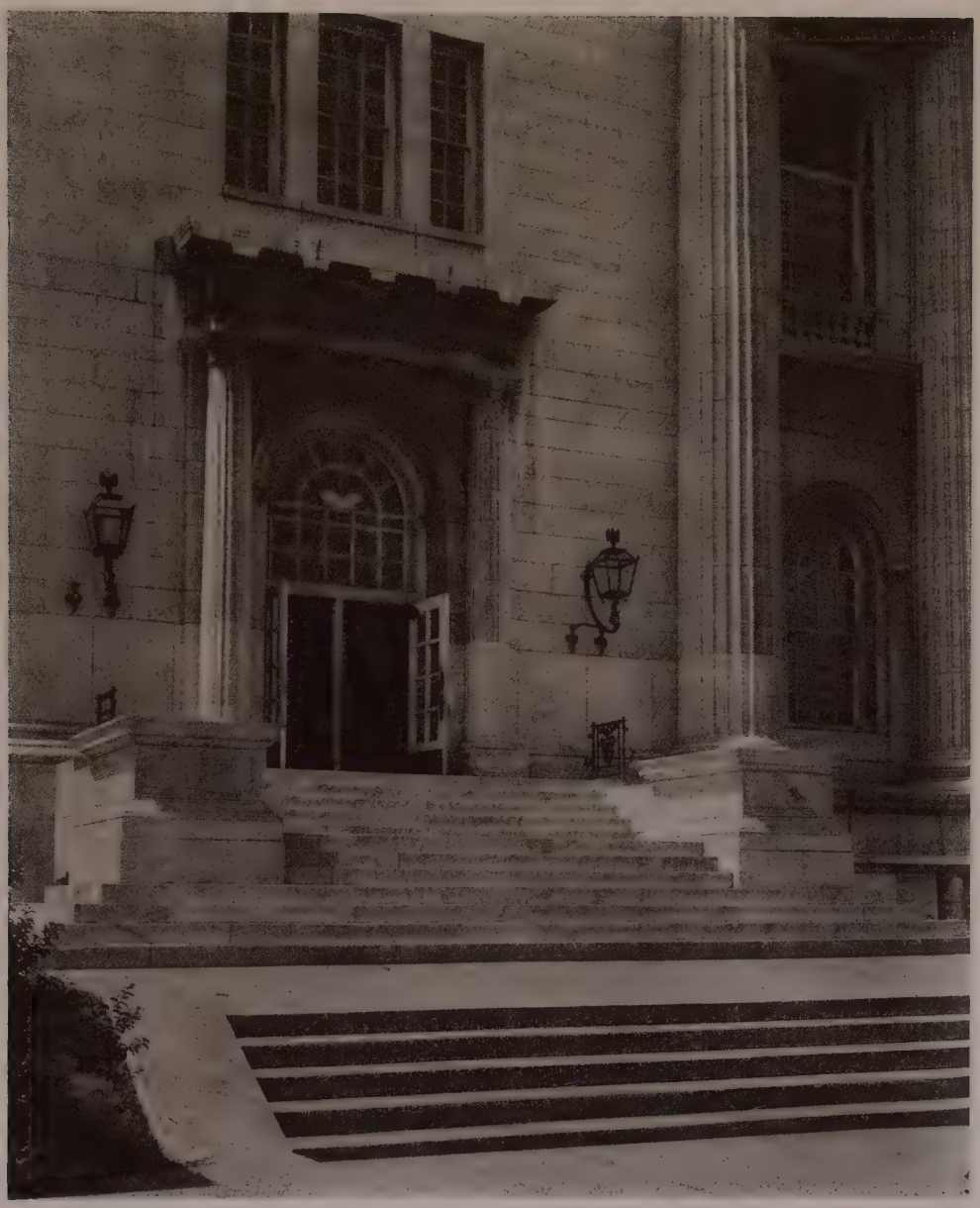
Detail of the Order on one side.

Knox Taylor and among the designs considered was one by Tracy, Swartwout and Litchfield, of New York, which ultimately was the one selected.

The programme for the Post Office required, on the ground floor, a large, well-lighted working space with a public corridor surrounding it, along with offices for the postmaster and other officials; on the second floor, three court rooms and the necessary judges' rooms and the usual various compartments incidental to the efficient performance of the legal machinery; on the third and fourth floors, rooms for certain government departments; and, finally, a basement.

"Three things had to be considered"—wrote Mr. Swartwout, in the *Architectural Record*, "the lighting of the post office working space, the arrangement of the court rooms and the provision for departmental requirements on the top floors. The court rooms must be entered by the public at one end and by the judges and jury at the other; this logically led to an E shaped plan with the courts forming the horizontals and a connecting corridor the vertical member; there was a narrow circulation on the inside of the side court rooms and the parallelogram completed by a central circulation at the back with offices on each side of the corridor. This meant, of course, that the

Judges' Entrance and Runway to Mail Delivery Platform.



Side Entrance

entire front of the building was given up to corridor space, but as this corridor was only 20 feet wide, the width of the post office lobby below, there was direct overhead light on the letter boxes in the screen—and further, the great colonnade, the feature of the front, did not obscure the light in any office. It was an unusual scheme, but proved workable and has a monumental effect with common sense as a basis. Also by placing the elevators and stairs at the corner on the outside wall we were able to get a heavy pier wall with which to terminate the colonnade."

The building occupies a full block in a rather out of the way section of the city. It is not in the business district, nor is it near the capitol group more recently developed. The four surrounding streets are of equal importance. As a consequence, the

The Post Office Lobby.

question, at the time of erection, of which way the building should front assumed a real importance. A compromise with the proponents of the various arguments was effected by having the mailing platform under a terrace with an easy runway to the basement, and by arranging the rear to look like a front.

The main elevation is substantially a large portico. Mr. Swartwout speaks of the order used in this elevation as follows: "In the competition drawing it was Ionic, somewhat like an overgrown Erechtheum Order, but with some study we evolved a variant using the national coat-of-arms in the cap, an eagle with outstretched wings over a shield, the curve of the wings corresponding to the dip in the line connecting the volutes, which is usual in Greek work. We studied that order very carefully at quarter and

then at three-quarter scale, and definitely established by figures the height, the upper and lower diameter, the location of the lower architrave face and the intercolumniation, and from these data we were able to start upon our plans.

"The side elevation gave us a great deal of trouble. The competition drawing showed a rather stiff classic treatment which did well enough on a thirty-second scale line drawing, but was rather banal and uninteresting when developed. After some deal of study, much more than should have been necessary, we threw our classicality to the winds and became rational, trying to use classic motives as the builders of the Capitol in Washington had done, with the result that the side of the building is more interesting than the front."

A rather interesting feature was the treatment of the light court. The walls were given a real architectural treatment, but at the scale of the interior rather than the exterior, with the idea of increasing the apparent size of the court and bringing it more in harmony with the interior design.

It was originally intended to build the exterior of Indiana limestone, but there developed such a demand throughout the state for the use of a local and more handsome material that the contract was finally changed to specify Colorado Yule, a white marble quarried in Gunnison County in the west central portion of the state.

The marble in the upper lobbies and in the court rooms was Eastman Cream, very carefully selected and with very little veining. This same marble is being used in one of Mr. Swartwout's latest designs, the Elks Memorial, in Chicago. The marble in the lower halls of the Post Office was also from Vermont, but of a different variety.

The acoustics of the court rooms, which are exceptionally satisfactory, were laid out under the supervision of the late Professor Sabine of Harvard, the man who first made acoustics a science. They were the first ones so laid out for the Government.

District Court Room in the United States Post Office and Court House at Denver, Colorado.

THE HISTORY OF MARBLE

Its Varieties and Value

By Col. John Stephen Sewell

(Courtesy *The Southern Banker*)

MARBLE is crystalline limestone. Most of the limestones of the world are believed to have originated from the accumulation of the calcareous remains of marine animals, such as corals and crinoids, on the bottom of the sea. This material accumulated through long ages, and in great thicknesses. In many cases they have been subsequently consolidated into limestones and then through earth stresses, under suitable conditions, compelled to crystallize into marble. Most of the marbles of the world belong to the Paleozoic era, the earliest of the geological eras in which there is an abundant record of life. Considering the extent to which modern civilization is dependent upon coal, iron ore and limestone, it is interesting to note that the more important deposits of all three of these materials are referred to in the same era. They are all believed to owe their accumulation to organic agencies, either vegetable or animal. It is a theme for philosophical reflection that these three rocks, as the geologist calls them, which are so necessary to modern civilization, were accumulated ages ago by more primitive forms of life, which so far as we know, flourished and disappeared before the human animal appeared upon the scene.

ENDLESS VARIETIES OF MARBLE

Marble occurs in endless variety and great abundance. The successful development of a marble deposit is, however, a slow and expensive proposition, and the available supply is dependent upon developed quarries, and not upon the great extent and abundance of deposits. The same agencies which made of marble the most beautiful of all the stones available for building purposes, also made it erratic in many ways so that there is always great waste in producing it, especially in the more desirable kinds and grades, and often no commercially suitable stone is obtained until after a great deal of development work has been done. This makes it intrinsically more expensive than many other building stones, but it is a product which is never sold at an exorbitant margin of profit, and it is worth all it costs and more. Possibly if it were less expensive to produce, it might also be less highly prized, notwithstanding its intrinsic beauty.

Marbles in an endless variety of color and texture are produced in Italy, Greece, Africa, France, Spain, Belgium, Norway, Germany and Switzerland, in the old world. The Greek and Italian deposits were worked long before the Christian era.

MARBLE IN DAYS OF ROME

It is interesting to note in Pliny's letters that in the days of Romans, marble was sawed into thin slabs by the same method which is used today. That is, by a strip of iron moved back and forth using sand and water as an abrasive to slowly wear the sawcut throught the marble. Today, we have gangs of saws and mechanical feed for the sand and water, so that whereas the Romans sawed off one slab at a time, we can have as many as seventy-five or eighty saw

A quarry in the Carrara district, in Italy.

blades working in the same block of marble at the same time. Pliny indignantly condemned the use of marble for the interior of buildings, as an unjustifiable waste of money. He also remarked that the Gods having placed marbles up in the tops of the mountains (as they actually did around the Carrara district), it was impious for man to presume to invade the mountain fastness and undo the work of the Gods. Notwithstanding his economical and religious objections to this use of marble, he described in a very practical manner how it is sawed, and strongly censures those contractors who delivered, for the purpose of sawing the marble, sand of such a coarse grain that the sawcut was made unduly wide and wasted much material in which money was already tied up. Pliny's condemnation of the use of such a rich and expensive material for the interior finish of buildings was, no doubt, a good advertisement in those days for the material itself. Just as condemnation of the automobile in these days probably only serves to increase the use of automobiles. Human nature seems to have been much the same in all ages.

EIGHTEEN PRODUCING STATES

In the United States, marbles have been produced in Vermont, Massachusetts, New York, Pennsylvania, Maryland, Tennessee, Georgia, Alabama, Missouri, Oklahoma, Texas, New Mexico, Nevada, Arizona, Colorado, California, Minnesota and Alaska. Marbles are also now being produced from Central America and South America.

Marbles vary in color from white to black

Two typical marble quarry shafts in Vermont. Note the modern motor-operated derricks.

through almost every color and shade of the spectrum. Sometimes they are coarsely crystalline, and sometimes finely crystalline. Almost any marble which can be produced in merchantable form finds its appropriate use somewhere in the market. As a rule, coarsely crystalline marbles are not as attractive as others for polished interior work. On the other hand, many of them are unsurpassed for exterior building work, and for monumental work. To a large extent, the marbles of the United States and of the entire world, for that matter, supplement each other so as to make available any sort of complete scheme that the architect may have in mind. Differences in crystallization give him a great choice in the matter of texture; differences in coloring and in distribution of coloring make it possible for him to have almost any color scheme that the mind of man can conceive.

VERMONT MARBLE

In Vermont are produced a considerable variety of marbles varying from fine crystals to those which have crystals of moderate size. There may be coarsely crystalline marbles in Vermont, but so far as known, none are being produced at the present time. Among the Vermont marbles are many grades of white marbles—that is, marbles in which the background is white even though there may be considerable veining and clouding. Among the white marbles a certain portion are very free of color—that is, almost pure white and eminently suitable for all the purposes for which such marbles are desired. The veined and clouded marbles are suitable for interior finish as well as for exterior and monumental work.

Vermont also produces a very desirable variety of Verde Antique, which, while classified as a marble, is not a crystalline limestone, but is really a rock constituted largely of serpentine. Vermont also produces a number of so-called fancy marbles—that is, those which are rich and variegated in color and suitable for highly decorative work. The leading marble company in Vermont is believed to be the largest marble concern in the world. The history of its inception and growth is one of the romances of a business which, if viewed from the proper angle, is never free of its romantic side.

In Massachusetts and New York have been produced marbles which would all be classed as white, although they contain generally more or less clouding and veining. They have found extensive use for the exteriors of buildings. The same is true of

marbles produced in Maryland and Pennsylvania, although Maryland has produced a small amount of fine-grained white marble which has been used for interior work.

MARBLE IN TENNESSEE

In Tennessee are produced a great variety of marbles of excellent quality. Their ground tone varies from a light warm gray and various shades of pink and brownish pink, to a dark chocolate. All grades and kinds of Tennessee marble have more or less of the characteristic pinkish hue which distinguishes them. Sometimes it is barely perceptible, at other times it is the outstanding characteristic of the marble itself. In size of crystals, Tennessee marble occupies a medium position. But the crystallization is never coarse enough to disqualify it for interior work. Tennessee marble is also interesting from the fact that the traces of the marine animals whose remains were the raw materials of which it was made, have not in all cases been wholly destroyed, but can be recognized very easily by a close examination of the stone. The fact that some of these forms have been perpetuated in the crystallization of the stone lends beauty and interest to the stone itself.

Where white marble is not desired and a rich variegated effect is also not desired, but where agreeable color, richness of texture and quiet dignity are desired, Tennessee marble is without any superior for interior work. It is also the best floor marble for floors that are subjected to very heavy foot traffic. It is nearly always sawed across the grain, and marble, like wood, always wears better under traffic if the grain stands on edge or on end instead of being parallel to the exposed surface.

GEORGIA MARBLE

The Georgia marbles are coarsely crystalline. This is their only drawback for interior work, and even this would not be a drawback but for the fact that finer grained marbles with the same color value are available. Most of the Georgia marbles have a white, or light gray background, but some of them have such an amount of heavy black clouding that this becomes the distinguishing characteristic. There is also one variety which has a pink background with the other clouding, which is characteristic of Georgia marbles generally. As an exterior building stone, Georgia marble is unsurpassed. Selected grades have a beauty and character all their own for monumental work, which makes their standing in this field secure for

Partial view of a Tennessee quarry.

DRAMA, shown above, is one of the figures on the main façade of the New York Public Library. Others on the façade represent PHILOSOPHY, ROMANCE, RELIGION, POETRY and HISTORY. The six figures were carved by Paul W. Bartlett out of white Georgia marble and placed on the building in 1916. Each one is approximately 13 feet high.

all time. The variety which has a pink background with a good deal of gray and black veining and clouding has been used in the Federal Reserve Bank Building at Cleveland, Ohio, and has produced a wonderful effect of soft texture combined with strength and massiveness. It is a variety of Georgia marble which in the past has not been sufficiently appreciated, possibly because its best sphere of usefulness has only recently been found.

FINE-GRAINED ALABAMA MARBLE

Alabama contains a number of different kinds of marble. At the present time, the only variety of marble actually produced in Alabama is a fine-grained white marble, generally containing more or less veining and clouding but occasionally yielding pieces of moderate size which are practically of statuary quality. Alabama marble has found its best use in the interior finish of buildings where white marble is desired. There has been no difficulty in selling the output of all of the active quarries for this purpose. Both the finer grades of Vermont marble and all grades of Alabama marbles have a background which is distinctly warm or creamy in tone as compared with the white marble imported from Italy. This has made them especially desirable in cases where this particular effect is desired, but it has been a cause for preference of Italian marbles in cases where the opposite effect is desired.

In addition to the white marbles Alabama has large deposits of marbles of a gray or buff gray tone and agreeable texture. It also has deposits of red and white variegated marbles and of various kinds of black marble, one of which seems to be really black Verde Antique. None of the Alabama marbles, however, except the white, have so far been commercially exploited. At the present time, the only places in the United States proper where fine-grained white marble suitable for interior use can be obtained are Vermont and Alabama, but marbles of this type are also produced in Alaska and find a ready market on the Pacific coast.

GRAY MARBLE IN MISSOURI

Missouri produces a variety of marbles generally of a gray or buff gray tone, which takes a good polish, and have found a ready market where marble is desired and cost is a vital consideration. They are generally somewhat less expensive than other marbles of the same general character, and very satisfactory. There are cases where marbles like the Missouri marbles are more suitable from every point of view than other marbles. So that each variety of marble finds its own sphere of usefulness in which it stands at the head of the list.

So far as known the quarries in Oklahoma, Texas, Nevada, New Mexico and Colorado are not, at the present time, operating, or if they are, they have only recently started up.

It is probable that more than one-half of the marble produced in the United States, at the present time, for all purposes, is produced in the South, so that the marble business has become a very important southern industry. Where marble is finished at the point of production, there is no business which brings a larger percentage of the final value of finished product into the state where it is produced, than marble.

MARBLE INDUSTRY IMPORTANT ONE

While the marble business is not a large one as compared with steel, cement, coal, etc., it is, considering the volume of the business, a highly important factor in the industrial upbuilding of any state where the industry is maintained.

While marble is not the least expensive in first cost, it is at least as permanent and

A view showing one of the newer openings in Alabama.
This is located at Gantt's Quarry.

satisfactory in use as any finishing material available. The cost of maintaining it is very small, and in high-class buildings when first cost and the cost of maintenance are considered together, marble is of all finishing materials available, the most economical. It resists stains and discolorations, at least as well as anything available. It is very easy to clean and keep clean. Properly cared for, it will retain its polish or other finish, practically as long as the building stands, but if desired, the finish can be removed or changed without prohibitive cost. The owners and managers of buildings in which the interiors are finished with marble should be warned about certain things:

First: Ordinarily the best way to clean marble is to use clean water and clean rags, and nothing else.

Second: Sometimes the film of dust that settles upon finished surfaces in large cities contains a little grease. Under such circumstances, a little ammonia or diluted alkali added to the water will produce satisfactory results. Alkalis will not injure the marble. As marble is limestone, acids will injure it, therefore, they should never be used.

Third: Under no circumstances should soap be used in cleaning marble. There is always some uncombined fat in soap. This will leave a slight film on the surface and will ultimately cause a disagreeable yellowish oily appearance in white or delicately colored marbles. This can be removed by the use of alkali but it is much better to avoid the use of soap, then the discoloration will not occur. This discoloration due to soap, only makes its appearance after a long time, and after the persistent use of soap or cleansing powders containing soap, but a weak alkaline solution is better than the soap to begin with, therefore, soap should never be used.

CLEANING MARBLE FLOORS

Fourth: Cleaning marble floors the same

precaution should be observed, but in this case, gritty material carried on the feet of the people who walk on the floors may grind itself into the surface of the marble slightly so as to be somewhat difficult to remove by ordinary effort. Where the traffic is light, this is entirely negligible. Where it is heavy this may become a matter of consequence. In any case, it is always well in maintaining marble floors to have them gone over occasionally with the floor-rubbing machines with which they were finished in the beginning. On the upper floors of an office building, this will be necessary only once in many years. In places where the traffic is extremely heavy, it may be necessary to do this several times a year.

Fifth: It rarely happens that any discoloration will make its appearance in marble which cannot be effectively removed or prevented, if the precautions above stated are observed. In the rare cases where such things do occur, the trouble can nearly always be corrected by the use of javel water, a preparation of bicarbonate of soda and of chloride of lime, which can be obtained from any druggist. The chloride of lime is a bleaching agent and it will not injure the marble, since the chloride in it already has all the calcium it can combine with.

Iron rust is the one staining agent which is able to penetrate and which cannot be removed. Therefore, in setting marble, care should be taken to prevent it from being in contact with any steel or iron which might be subject to rust.

* * *

EDITOR'S NOTE: *Investigations now being made by the Bureau of Standards give promise of yielding methods of removing rust stains, and indicate that the film left by soap may be due to hard water and not primarily to the soap. See first article in this issue.*

A general view of a quarry at Phenix, Missouri, that produces a gray marble.

St. Ann's Church, Phoenixville, Pa.

Marble In The Small Church

FROM time immemorial, man has recognized the close association of religion and beauty. "In days of yore," wrote Schiller, "nothing was holy but the beautiful." Bancroft expressed the same thought when he said: "Beauty itself is but the sensible image of the Infinite."

Even the humblest church of today can afford to enrich its interior with that most beautiful of all building materials—Marble!

A LIST OF THE WORLD'S MARBLES

By J. J. McClymont

Note—In a past issue, Mr. McClymont proposed, for the sake of convenience, to divide the different marbles into four groups. These arbitrary groupings were as follows:

Group A — Any marble or stone sold to the trade in fair-sized slabs or blocks of commercial size, rectangular shape and guaranteed by the seller to be sound, free from natural defects, that can be finished at a minimum cost, and sold to the consumer as sound marble.

Group B — Any marble or stone sold to the trade in slabs or blocks of fair or medium size, generally rectangular shape, guaranteed to be sound and free from natural defects, the finishing of which, because of texture, the size of slabs, the shape and size of blocks, is somewhat more expensive than those in Group A.

Group C — Any marble or stone that cannot be sold as sound but contains a minimum amount of natural defects, such as dry seams, old fractures, partially or completely healed surface voids, etc., to be treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as semi-sound marble.

Group D—All marble, stone and so-called serpentine marbles, and Onyx, which, by their peculiar formation are known to be fragile, such as Breccias and nearly all highly colored marbles and serpentines, and that are sold to the trade in irregular shaped blocks or slabs without a guarantee as to their soundness, treated by the manufacturer in the most approved manner, reinforced where necessary by liners on back or metal inlays and sold to the consumer as unsound marble.

Pink Tennessee—See Tennessee Pinks:

Gray Eagle Pink	Cedar Pink
Gray Knox Pink	Knox Pink
Bond Pink	Ross Pink
Craig Pink	Asbury Pink

Pipestone—See Catlinite.

Pisa—See Fiorito di Pisa.

Pisogne Onyx—See Italian Onyx.

Pistoja—See Verde de Pistoja.

Piszko Sutto Rot

Sutto Quarries, on the south bank of the Danube, about twenty miles from Budapest, Hungary.

Light red with scattered dots and spots of dark red.

Pittsford Italian—Group B.

Turner Quarry, near Fowler Station, Pittsford Township, Vermont.

There are several varieties of the Pittsford Italian, though only two are recognized in trade. These are the D layer and the Y layer. In the D layer the ground is shaded, white in some parts, yellow in the very light shades elsewhere and one charm of the marble is in the manner in which the white and yellow are intermingled. Running through the ground are distinct veins of yellowish-brown and olive, or in another part of the stone these may be dark gray or even black. These veins are all narrow, much crumpled and irregularly distributed.

In the layer Y we have more intricate entaglement of veins and bands of a dark bluish tint. These veins never seem to coalesce as in many marbles, but although constantly changing their direction they do not mingle. Although, there are the dark veins mentioned, they are not sufficiently abundant to essentially darken the marble which is always very light in general tone.—Report of the Vermont State Geologist.

Takes fair polish.

Pittsford Valley or Light Florence Marbles —Group B.

Florence Quarry No. 2, near Fowler Station, 1,000 feet southwest of the old Turner Quarry, and one and one-quarter miles almost due west of Pittsford Station, Pittsford Township, Vermont.
Bluish-white, abundantly blotched and clouded by dark spots usually elongated, and there may be distinct dark lines. (Vermont State Geological Survey.)
Takes fair polish.

Pittsford Valley, H Layer—Group B.

Quarried at same quarry as Pittsford Valley, and at the High Street Quarry, one-half mile southeast of Brandon, Vermont.
Bluish-white or pure white with bluish lines, spots, and blotches which run from faint to decided markings.
Takes fair polish.

Pittsford Valley, M Layer—Group B.

Quarried also from the Florence No. 2 Quarry.
Bluish-white with light green bands which in some portions almost completely cover the surface.
Takes fair polish.

Pittsford Valley, X Layer—Group B.

From the Florence No. 2 Quarry.
Bluish - white with numerous greenish veins.
Takes fair polish.

Pittsford Valley, W Layer—Group B.

From the Florence No. 2 Quarry.
Practically the same as Pittsford Valley, M Layer.
Takes a fair polish.

Plagioclase

A term applied to all those feldspars that are not potash feldspar.

Plasma or Smaragdus Cyprius and Lapis Smaragdinus.

Pullen says: "This stone comes from Cyprus, and is found sparingly in the Tyrol, semi-transparent, mottled bluish-gray, with flaws of chalky white."

Plateau White

Same as Dorset B.

Plougastel Marbles

Marbles quarried in this locality in Finistere, France, exhibit various tones of bluish-gray. (Blagrove.)

Plymouth

Quarried at Plymouth, Vermont.
Blue or bluish-brown with stripes and marks of white.
Not available.

Plymouth Black

Radford Quarries, Plymstock, Devonshire, England.
Of two varieties, one is black with white veins and small gray markings, the other is black with heavy veins of bright red.

Plymouth Dove

Radford Quarries, Plymstock, Devonshire, England.
Soft toned gray with small yellow markings.

Plymstock — See Hooe Lake, Plymouth Black, Pomphlett and Prince Rock.

Pocahontas or Alabama Pocahontas.

Gantts Quarry, Alabama.
White with markings of various tints.
Not available.

Pocombe

Quarried at Exeter, Devonshire, England.
Purple with white veins.

Podolsk

Kreistadr Quarries, near Podolsk, Government of Moscow, Russia.
Yellow, containing numerous small white fossil. (Watson.)

Poggio di Rossa

The marbles quarried in this locality in Tuscany, Italy, are yellow spotted with yellow and black. (Blagrove.)

Poggio Silvestro Quarry, Tuscany, Italy.

The White Statuary from this quarry according to Geo. P. Merrill in "Stone for Building and Decoration," page 337, is considered superior to the product of the Betogli Quarry. The Statuary from both quarries ranks as the best in the known world.

Point of Rock—See Potomac.

Pojizonazzo

Lahn Quarries, Wetzlar, Nassau, Germany.
Bright red, intersected with brown and white patches and veinings. (Watson.)

Policroma

Name given to Traccagnina Marbles by Belli.

Poligny (Onyx)

Quarried near Poligny, Jura, France.
White semi-transparent and sometimes showing shades of yellow and red. (Blagrove.)

Polla—See La Polla.

Poltesco Cove—See Cornish Serpentine.

Polvaccio

Near Carrara, Italy, is one of the oldest Italian quarries, having been operated for nearly two thousand years. Jervis mentions a block of Statuary from this quarry measuring 18 cu. m. (approximately 615 cubic feet).
Is snow white, fine grained Statuary, more opaque than that from the Crestola Quarry and of greater density than any other Carrara Marble.

Polveroso

Quarried at Pistoja, Tuscany, Italy.
Black, sprinkled with small spots of white and gray. (Blagrove.)

Polyphant (Peridotite).

Quarried at Polyphant, near Launceston, Cornwall, England.
Dark blue-gray with fine markings of darker shade. (Renwick.)
Dark green, with reddish-brown spots scattered evenly. (Watson.)

Polzevarra or Polzevarra di Genova

Same as Genova Green.

Pomato Alabastro

Same as Alabastro Pomato.

Pompeian Red or Dark Red Champlain.
Quarried at Swanton, Vermont.
Dark reddish-brown mottled.
Takes high polish.

Pomphlett
Pomphlett Quarries, Plymstock, Devonshire, England.
Black with numerous white veins. (Watson.)

Pont de L'Isser Quarries—See Algerian Onyx.

Ponte-Decimo Quarries—See Genova Green.

Poolvash Black
Poolvash Quarries, Isle of Man.
Black with an occasional fossil. Runs from hard to soft texture, the hard portion will take a good polish, while the softer portion will not take a polish and is sometimes covered with varnish.

Poppenberg—See Green Poppenberg.

Poppi
The marble from this locality in Tuscany, Italy, is grayish-green brecciated and veined with yellow. (Blagrove.)

Porfido (Porphyry)
According to Pullen:
The ancient Porphyrys in the following list prefixed Porfido are from unknown quarries, probably Egypt.
Generally they are very dark reddish-purple crowded with small pinkish dots. The description of each variety, also by Pullen, mentions only the manner in which they differ from the general description given above.

Porfido Bigio Rosastro—Pinkish cast.

Porfido Bigio Turchinicco—Bluish tinge.

Porfido Nero—Black, slightly tending to green with little white crystals.

Porfido Nero Antico—Same as last one given above.

Porfido Nero Grafico—Oblong white or greenish crystals and tiny lumps of milky quartz akin to Agate or Chalcedony.

Porfido Rosso

Porfido Rosso Antico

Porfido Rosso Chiaro—Color very bright, inclining to purple.

Porfido Rosso Confuso—Pink spots very much crowded and confused.

Porfido Rosso Cupo—Darkish-red with rosy white and a few black crystals.

Porfido Rosso Laterizio—Brick-red spotted with pink and transparent white, a few spots of black.

Porfido Rosso Pavonazzo—Dark purple with even crystals of milk white.

Porfido Rosso Pomato—Blood red with crystals of rose, and black with patches of grayish-green.

Porfido Rosso Porporino—Blood red with many crystals of lighter red and a few white.

Porfido Rosso Scuro—Dark red with patches of light green.

Porfido Serpentino — This is probably same as Green Porphyry.

Porfido Serpentino Agatato—Spots of Chalcedony instead of white quartz.

Porfido Serpentino Bigio Nero—Same as Porfido Nero.

Porfido Serpentino Bruno, or Porfido Bruno and Brown Antique Porphyry, brown with green crystals and many spots and veins of Chalcedony and Corniola.

Porfido Serpentino Verde—Dark green with crossed crystals (others star-like in light green) and white quartz.

Porfido Serpentino Verde Cupo—Dark green spotted black with Chinese letters of light green.

Porfido Verde—Olive green with many little crystals of yellowish-green and larger ones of white.

Porfido Verde Bigio—Bluish-white even crystals of quartz, or bluish or whitish feldspar and others black and smaller.

Porfido Verde Dorato—Tinge of gold.

Poros Stone

This name is used by the Greeks for an inferior marble used as a base for Stucco.

Porphyre Brun des Vosges

Quarried on Mount Evres, near Ballon, France.

Chocolate brown with numerous white semi-transparent crystals. (Blagrove.)

Porphyre Noir Des Vosges

Quarried at Framont.

Black. (Blagrove.)

Porphyre Violet des Vosges

Quarried at Mount Ocelle.

Deep blackish-violet with large crystals. (Blagrove.)

Porphyrite (Quartzless Porphyry)

Hull defines this rock as having a felsitic base of Labradorite or Oligoclase, with individual crystals of feldspar.

Porportion of silica 59 to 61 per cent. By the appearance of Augite, Porphyrite shades into Melaphyre.

Porphyrites Leptopsephos

Same as Red Porphyry (Egyptian).

Porphyritic

When a rock consists of a compact or fine and evenly crystalline ground mass, throughout which are scattered larger crystals, usually of feldspar, the structure is said to be Porphyritic. (Geo. P. Merrill.)

Porphyry

This is not a marble, but some varieties are used for interior decoration. See Red Prophyry, Antique Porphyry, Black Antique Porphyry, Porfido Bruno, Elvan Porphyry, Luxullianite, Launceston Tremore, Vert des Vosges, Vert des Pyrenees, Porphyre Brun des Vosges, Porphyre Violet des Vosges and Porphyre Noir des Vosges.

This material is found in nearly all parts of the world and those named above are the only ones of which any detailed information is available.

Porphyry of Egypt—See Red Porphyry of Egypt.

Porphyry Green—See Green Porphyry.

Porpora

Signifies purple color.

Porracci (White Statuary).

Quarried from Monte Altissimo, Seravezza, Tuscany, Italy.
Pure white, but has not quite the beautiful color of the best Statuary. (Watson.)

Porta Santa (Portals of the Saints).

An ancient marble quarried on the island of Chois off the west coast of Asia Minor. This island is called Chios by the Greeks, Saki Adasi by the Turks, Scio by Italians and Knio by modern geographers.
Another ancient marble under this name was quarried on the island of Jasus off the coast of Proconnesus, modern Marmora, in the sea of Marmora.
Some writers claim that Porta Santa is the same as Claudian Stone. In this they are mistaken, as Claudian Stone is a granite and has nothing in common with Porta Santa, but when we consider the number of varieties of Porta Santa, both ancient and modern, it is not surprising that mistakes of this kind should occur. The general colors of the ancient stone as described by different authors shows a wide range of colors. Miss Portor says: "Portor Santa differs in color from almost monochrome pinks and meaty looking reds to gray and dark gray with reticular network of yellow or red."
Watson describes a sample as "having a light and dark gray matrix traversed by slender irregular red and yellow veins."
Pullen in "Stones of Rome" gives the following list and description:

Porta Santa Alabastrina — Bright and variegated with streaks resembling Alabaster.

Porta Santa Arlecchina—Patched lilac and gray.

Porta Santa Biclore—Patches of flesh color and gray or patches of bluish-gray and reddish-brown.

Porta Santa Bigia—Dull gray, veined with white and red.

Porta Santa Bigia Brecciata—Gray pebbles.

Porta Santa Bigia Dorata—Blackish-gray with gloss of gold.

Porta Santa Bigia Fiorita—Very dark uniform gray, finely crushed and streaked with red and reddish-brown.

Porta Santa Bigia Nuvolata—Clouded and mottled gray, streaked with white and red.

Porta Santa Bigia Orbicolare—Light gray crammed with round stains of gray and flesh color.

Porta Santa Brecciata—Mottled pink with irregular patches of dark gray, small angular flesh-colored pebbles and streak of pure white.

Porta Santa Brecciata Lumacata—Yellowish-gray pebbles on brownish-red, with streaks of white and a few white snails.

Porta Santa Brecciata Minuta—Small flesh-colored pebbles on dark reddish-brown.

Porta Santa Bruna et Rossastra—Brown and pink.

MANUFACTURERS' AND TRADERS' NATIONAL BANK, BUFFALO, N.Y. ARCHITECTS, FURNESS, EVANS & CO., PHILADELPHIA, PA. MATERIAL, GEORGIA MARBLE

GEORGIA marble is a desirable material for important buildings, because of its natural beauty, its extreme durability, and its preservation of architectural detail.

Through the use of Georgia marble, the architect can bring his study of location, design and material to a satisfactory conclusion.

Georgia marble, unequalled for attractiveness of appearance and durability, has been endowed in the making with superior working qualities.

Furthermore, it is a material which not only conveys an atmosphere of "quality," but also expresses such desirable attributes as elegance, strength and stability.

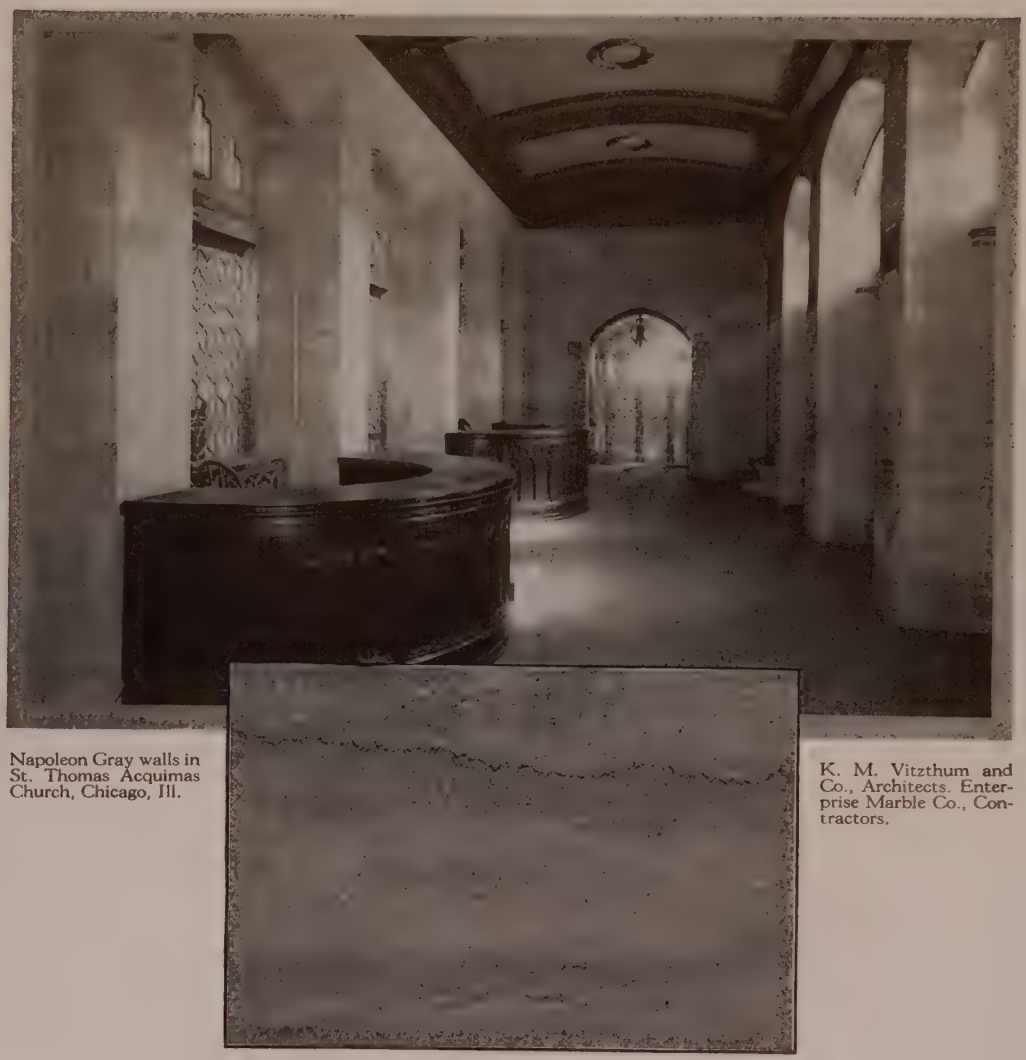
THE GEORGIA MARBLE COMPANY

TATE, GEORGIA

Eastern Office, 1328 BROADWAY, NEW YORK

Western Office, MONADNOCK BUILDING, CHICAGO, ILL

Napoleon Gray



Napoleon Gray walls in St. Thomas Acquimas Church, Chicago, Ill.

K. M. Vitzthum and Co., Architects. Enterprise Marble Co., Contractors.

A Marble of Extraordinary Qualities

IN color gray, but a gray that has life and charm and distinction.

In use impervious to moisture, non-slip and carvable. For exterior or interior in any size or quantity you require.

In price so low that you too will join the great army of architects and contractors who use it steadily.

Samples on request

PHENIX MARBLE COMPANY

SUITE 609, SCARRITT BLDG.

KANSAS CITY MISSOURI

THE BEAUTIFUL MAIN STAIRWAY
OF THE
STEARNS COUNTY COURT HOUSE
ST. CLOUD, MINN.

Toltz, King & Day, *Architects*
Chas. Skooglum, *Contractor*

The columns and pilasters are of Breche Violette, the wainscoting of Light Botticino; the floors are of Gray Pink Tennessee with borders of Dark Tennessee Sylvan Green.

NORTHWESTERN MARBLE & TILE CO.
27TH STREET & 27TH AVENUE, SOUTH
MINNEAPOLIS MINNESOTA

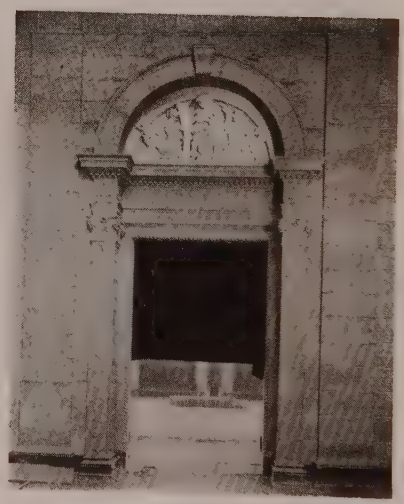
A counter just erected by us in a florist shop, intended to be used as a writing desk.

The dark marble is Black and Gold; the white is imported Italian marble.

THE BRADBURY MARBLE COMPANY
ST. LOUIS :: :: MISSOURI

THE illustration above shows a large panel carved from Tennessee marble nearly completed in our factory and intended for the University of Minnesota Library.

The smaller picture to the right was taken during construction and shows this panel set in place. The cove base is Alps Green; the walls and carved architrave are of Mankato stone.



DRAKE MARBLE & TILE COMPANY

Interior Marble Work

ST. PAUL, MINN. - - MINNEAPOLIS, MINN.

THE BRANIFF BUILDING, OKLAHOMA CITY, OKLA.

Gray Tennessee Marble ashlar wainscoting and floor; Friendsville Pink Tennessee Marble base.

TAYLOR MARBLE & TILE CO.
511-521 WEST PINE STREET
OKLAHOMA CITY OKLA.

Entrance Lobby of Apartment Building, at S.W. Cor. Woodward and Moss Avenues, Detroit. Robt. J. West, Architect.

A rich effect obtained by the use of Vermont Mountain White for cap, trim and stiles; Royal Antique for the panels and balustrade; and Florence for the steps. The mantel is Black and Gold. These marbles were installed by

THE DETROIT MARBLE CO.
9045 LIVERNOIS AVE. DETROIT, MICH.

LOBBY OF THE FEDERAL RESERVE BANK OF CLEVELAND, OHIO

WALKER & WEEKS, *Architects*

This beautiful corridor, full of life and color, is made doubly effective by the choice of marbles used.

These marbles were installed by The Haworth Marble Co. The standing marble is Old Convent Siena. The floors are Tavernelle Tennessee, with Belgian Black strips.

THE HAWORTH MARBLE CO.
CLEVELAND - OHIO

GENUINE HAUTEVILLE C.H.

VIEW OF ONE OF OUR HAUTEVILLE QUARRIES

Of all monotones, genuine Hauteville C.H. is the most beautiful, the most reliable, the most satisfactory. On all blocks of the genuine Hauteville this mark appears

C.H.

PROTECT YOURSELF BY SPECIFYING WITH THIS MARK

Sole Agents for U. S. and Canada

C. D. JACKSON & CO., INC.

140TH ST., LOCUST AVE. & EAST RIVER — NEW YORK CITY

Elevator lobby, Sunderland Bldg., Omaha

The floor is a buff monotone, with a Napoleon Gray border. The base is Westfield Green; the die and trim, Alaska marble. Furnished and installed by Sunderland Bros. Co. The architect was Geo. B. Prinz.

SUNDERLAND BROS. COMPANY

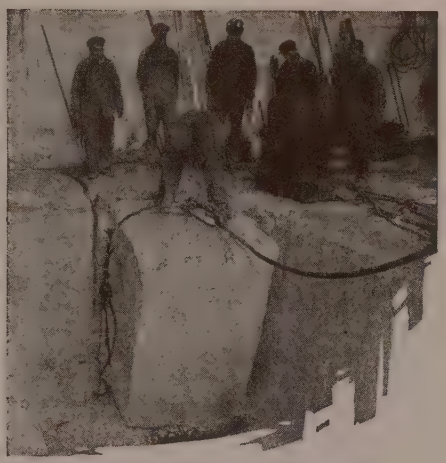
Marble Department

Main Offices, SUNDERLAND BLDG., OMAHA, NEBRASKA

This English Veined Italian marble stairway was furnished and set by us for the Leyman Motor Co., Louisville, Ky., agents for the Buick car. The architect was Captain Brinton B. Davis, of Louisville.

PETER & BURGHARD
STONE COMPANY

LOUISVILLE KENTUCKY



© Underwood & Underwood, N.Y.

Rough quarried block about to be hoisted from quarry of Vermont Marble Company

We are Wholesale Dealers, Importers and Quarry Agents for:

Lee and West Stockbridge
Vermont and Tennessee
Carthage
Imported Marbles

IN BLOCKS OR SLABS
TILE AND TERRAZZO

REES-VOLCKMANN CO., INC.

344 Walnut Avenue :: NEW YORK

Main Banking Room
of the Pennsylvania Company,
Packard Building,
Philadelphia.
Ritter & Shay, Architects.

Main Entrance to Banking Room

The marble work in the Pennsylvania space in the Packard Building illustrates an always effective combination—Napoleon Gray for the floors and Botticino for the walls, columns and counters. This was erected by us for the McClymont Marble Company, of Milwaukee; the General Contractor was the Thompson-Starrett Company, of New York.

SALOMONE-O'BRIEN MARBLE CO.

KNOXVILLE - - - TENNESSEE

THE J. L. HUDSON CO.
DEPARTMENT STORE
at
Detroit, Mich.

The marble floor shown here is Travertine with a Westfield Green coved base and border. Approximately 75,000 square feet of floor space were treated in this way.

Incidentally, all of the toilets in the big building were wainscoted with marble.

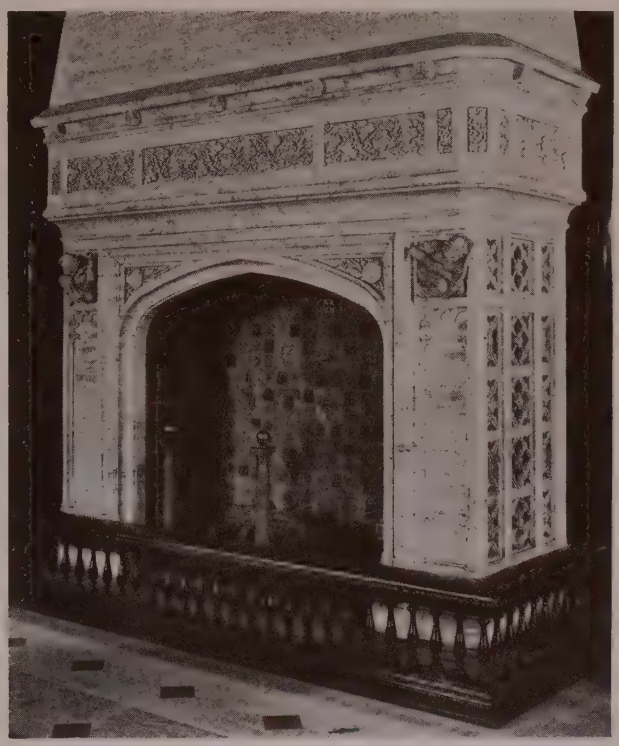
CHRISTA-BATCHELDER
MARBLE COMPANY
DETROIT MICHIGAN

An exceptionally beautiful mantel in the Columbia Club, at Indianapolis. Executed in

ROMAN TRAVERTINE

RUBUSH & HUNTER
Architects

F. E. GATES
MARBLE & TILE CO.
INDIANAPOLIS :: INDIANA



INTERIOR of the Foreman National Bank, Chicago, Ill. The architect, Charles S. Frost, of Chicago, has secured a splendid effect by the use of Galena Siena in the counters, with Pink Tennessee and Belgian Black in the floor. The marbles were installed by the McClymont Marble Co.

McCLYMONT MARBLE CO.

TWENTY-SEVENTH AND CANAL STS.

MILWAUKEE - WISCONSIN

All the marble work for the
LIBRARY OF CONGRESS
IN WASHINGTON
is in Fabbricotti's Italian and
English Veined marble

The complete facilities of this organization include large and fine quarries for White Italian and English Veined marble, owned and operated by this company. Our mill equipment comprises eight saw gangs, assuring quick and efficient service.

ALL FOREIGN MARBLES

C. Fabbricotti e B. Fabbricotti & Figli . Carrara, Italy
N. Lazzoni & Figlio . . . . . Carrara, Italy

F. De BELLEGARDE, INC.

Marble and Stone

OFFICE, YARD, MILL AND WHARF
1039 Boulevard, Long Island City, N.Y.

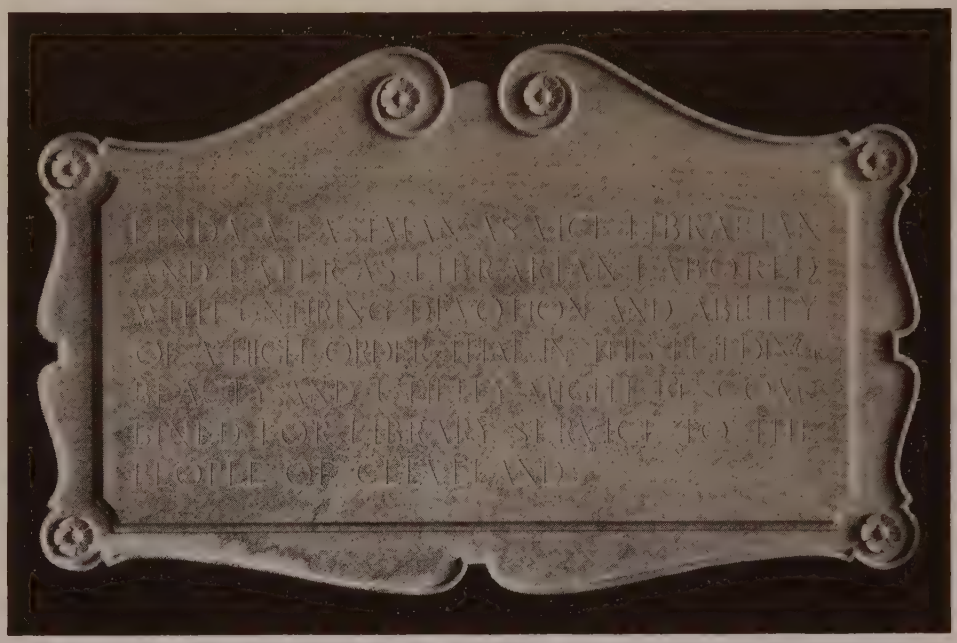
EXTERIOR OF THE ZIEGLER RESIDENCE, NEW YORK CITY; EXECUTED IN "CRAIG PINK" TENNESSEE MARBLE

Producers of the following brands of Tennessee marble, blocks, slabs, tile and border:

LaMarr Gray
Fontaine Gray
Victoria Pink
Marmor Pink
Dark Cedar
Craig Pink

JNO. J. CRAIG COMPANY

KNOXVILLE :: TENNESSEE



ONE of several marble tablets executed by the Hilgartner organization and installed in the Cleveland Public Library, Cleveland, Ohio. This tablet is of Eastman Cream marble.

WALKER & WEEKS, Architects.

Send for our brochure, "Marble Adaptations," containing views of interesting treatments and valuable information about the care and cleaning of marble.

HILGARTNER MARBLE COMPANY

Importers and Finishers of Interior Building Marble

BALTIMORE - - MARYLAND

The largest stock
of
Foreign Marbles
in America

ESTABLISHED 1883
NATURE'S MOST J·J· DEPENDABLE QUALITIES

JEROME A. JACKSON
IMPORTED AND DOMESTIC
MARBLE
SANFORD ST. AND EAST RIVER, LONG ISLAND CITY, N.Y.

VIEW OF ANTONIO BIGGI'S BLACK AND GOLD PRODUCTION A29B

From this quarry we have supplied blocks of Black and Gold to make monolithic columns of 16′x 2′8″ for the American Marble & Mosaic Co. of San Francisco. We believe that this type, A29B, of Black and Gold, is the soundest and most practical of all types.

ANTONIO BIGGI
Foreign Marble & Stone
YARD AND OFFICE
SANFORD ST. AND VERNON AVE.
LONG ISLAND CITY NEW YORK CITY

A Difficult Problem

On account of the kite-shaped treads, this circular marble stairway in the addition to the Colonial Trust Company building, in Pittsburgh, presented a perplexing problem to the architect, F. J. Osterling.

However, we prepared for him a full size plaster model, cut the pieces apart and made up the marble itself in accordance with these pieces. The result speaks for itself.

The side walls and balustrade are of Crestola Pavonazzo; the treads and risers are of Veined Italian Statuary. The combination is decidedly effective.

ROBERT K. GLASS & COMPANY, Inc.

(*formerly* Lautz Marble Corporation)

1210 EAST FERRY STREET :: BUFFALO, NEW YORK

Fountain in the American Furniture Mart Building, Chicago.

The dominating feature of the 16th floor lobby is easily this handsome creation in marble. The fountain is imported Verde Antique; the back is made up of Curley Green panels with Vermont Green stiles. N. Max Dunning and Henry Raeder, associate architects.

PEERLING MARBLE CO.

CHICAGO - - - - ILLINOIS

BUDER GRADE SCHOOL, ST. LOUIS, MO.
R. M. Milligan, Comm. of School Bldgs., *Architect.*

The treads are of Lake Champlain marble. All the other marble throughout is Carthage Imperial Gray. Finished and installed by Union Marble & Tile Co.

GRAY IMPERIAL MARBLE — CARTHAGE MARBLE & WHITE LIME CO.

CARTHAGE MARBLE AND WHITE LIME CO.

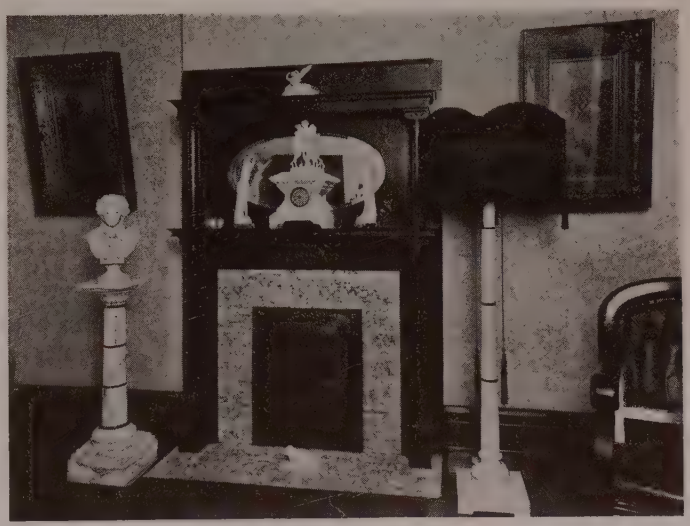
CARTHAGE :: MISSOURI

HOME FURNISHINGS OF MARBLE

The pedestal and lampstand are of Alabama marble, with bands of Black and Gold.

The Lamb, the bust of Beethoven and the clock are of Colorado Yule marble.

These were all fabricated in our plant for a St. Louis residence.



UNION MARBLE & TILE COMPANY

WILLIAM C. FOX, *General Manager*

1109-27 SOUTH SEVENTH BLVD. - - ST. LOUIS, MO.

View in Lobby of
PEABODY HOTEL
MEMPHIS, TENN.

W. W. Ahlschlager, *Architect*

Interior marble work finished and set in place by Alabama Marble Company, Gantt's Quarry, Ala. Marble base, Belgian Black; wall marble above, Rose St. Genevieve; curb of fountain, Black and Gold. Fountain is Roman Travertine, made of one block specially quarried and imported for this purpose.

ALABAMA CREAM A

A recognized standard among Interior White marbles. Unsurpassed for decorative and utilitarian purposes. Fine-grained, with CREAMY-WHITE background and moderate clouding.

Impervious, non-staining, weather-proof and durable. Carves perfectly; takes and holds any polish from dull gloss to brilliant lustre.

The Alabama Marble Company has supplied millions of dollars' worth of Alabama marble in hundreds of buildings without causing a single day's delay on any one of them.

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Main Office and Plant
GANTT'S QUARRY, ALABAMA

Sales Department
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Producers of all grades of Alabama Marble, Manufacturers and Contractors for interior marble work in ANY KIND OF MARBLE.

Inquiries for prices and estimates should be addressed to the Sales Department, Birmingham, Alabama

THE MELROSE PARK
STATE BANK
MELROSE, ILL.

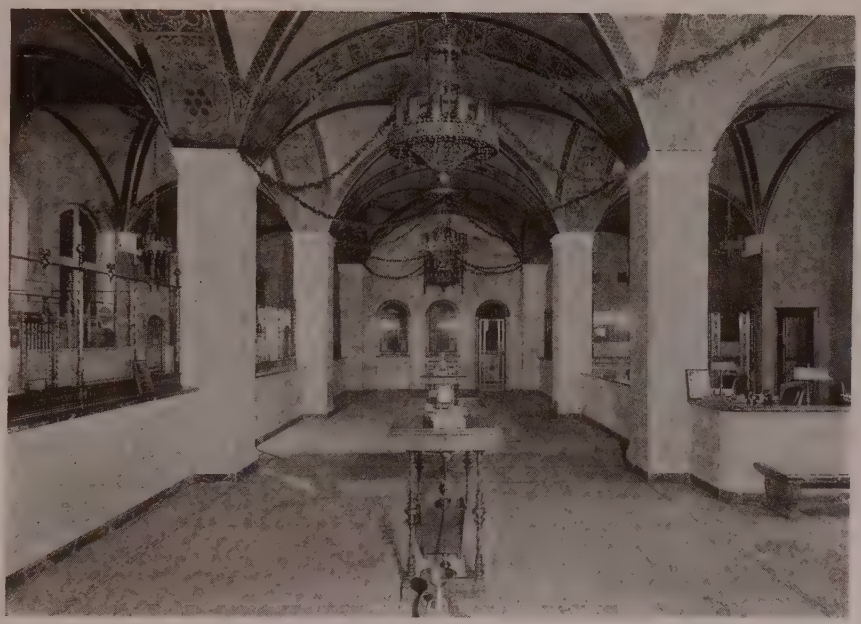
W. G. UFFENDELL, *Architect*

The floors in this banking room are of White Vermont, with an inner border and base of Verde Antique marble. The fixtures and wainscot are Tavernelle Claire.

HENRY MARBLE COMPANY

3208 SHIELDS AVENUE

CHICAGO .. :: ILLINOIS



PUBLIC SPACE, GRISWOLD NATIONAL BANK, DETROIT, MICH.

SMITH, HINCHMAN & GRYLLS, *Architects* ANDRES STONE & MARBLE CO., *Interior Marble Work*
BRYANT & DETWILER COMPANY, *General Contractors*

ESTABLISHED 1880

ANDRES STONE & MARBLE CO.

Main Office and Works
MILWAUKEE, WIS.

Branch Mill & Quarries
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Permanency in Home Building

Most people appreciate the beauty and impressiveness of a marble home. Like Tom Moore, they like to dream of living in marble halls, but often their dreams fail to come true because they have a wrong understanding of the expense. They look only at the first cost. They mistake low prices for economy.

Marble, once in place, begins immediately to pay dividends. It needs no painting, no repairs. It cuts down fire-worries and insurance rates. It serves the men of today and the children of tomorrow. It's an investment, not a luxury.

In the home of Donald P. Schmitt, the cost of the marble work was unusually low. It is what is known as random ashlar construction—no regularity in courses, and no attempt to match the colors. And even these contrasts seem to contribute to the charm of the walls. The contract for this work was in the hands of the Stark Interior Marble & Tile Company, of Canton, and the marble was provided by our Vermont quarries.

Residence of Donald P. Schmitt
Canton, Ohio. Stark Interior
Marble and Tile Co.,
Contractors.

VERMONT MARBLE COMPANY

PROCTOR, VERMONT

Branches in the larger cities

See Sweet's Catalog for Specifications and Other Data

HAULING
MARBLE BLOCKS
AT CARRARA
ITALY

TABER AND COMPANY

The Oldest Importers of Italian Marble

801 VERNON AVENUE
LONG ISLAND CITY NEW YORK

BANK OF CALIFORNIA

SEATTLE, WASHINGTON

D

A colorful but not-too-ornate treatment, attained by the use of Escalette marble for banking screen, check desk and bench. The material was furnished by us and installed by Oliver E. Lutz, of Portland, Oregon, and Seattle, Washington.

JOHN J. DEERY COMPANY, INC.

IMPORTERS AND WHOLESALERS
MARBLE & STONE
LONG ISLAND CITY :: :: NEW YORK

This luxurious interior is one of the show-places of the South-West. The floors are of Tennessee marble; the balance is English Veined Italian. All the marble was fabricated by the Candoro Marble Company, and installed by the South-West Marble Company.

CANDORO MARBLE COMPANY

Manufacturing Contractors

FOREIGN AND DOMESTIC MARBLES

KNOXVILLE :: :: TENNESSEE

Supper Room, Coronado Hotel, St. Louis. P. J. Bradshaw, Architect

A GILDED VAULT ON COLUMNS OF ST. GENEVIEVE GOLDEN VEIN

The Office of P. J. Bradshaw writes an ad for us:

"Owing to existing conditions, the plan of the Pal-Lido Supper Room of the Coronado took its present form and necessitated the use of columns and pilasters as a decorative treatment, supporting the gilded vault above.

"We have learned by experience that any material less durable than marble would not stand the abuse which corners and projections receive in a room of this character.

"Imported marbles are expensive and the delay in procuring same a consideration. Finally, after going over our sample files, we came across a beautifully veined piece of St. Genevieve Golden Vein which suited our color scheme and which our contractor informed us was readily obtainable and at a moderate cost.

"This was chosen, and the component colors of the marble were used in the alternate squares of the terrazzo floor. The walls and ceiling of plaster were tinted and gilded in harmony."

No matter what your problem, we have a marble immediately available to solve it.

TOMPKINS-KIEL MARBLE COMPANY

505 FIFTH AVENUE
NEW YORK CITY

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COLONIAL GREY MARBLE

Storage Yard for Colonial Grey Marble.

When the architect specifies COLONIAL GREY MARBLE he is sure of not only getting excellent results but also good service, as our large yard and sawmill capacity insure prompt shipments.

F. W. STEADLEY & COMPANY, INC.

"The Big Quarry"

Producers of COLONIAL GREY VEINED - COLONIAL GREY VEINLESS

CARTHAGE :: :: MISSOURI

Representatives for New York City: MICHAEL COHEN & Co., 8 West 40th Street, New York City
Representative for Pacific Coast: JOHN M. FABBRIS, Sharon Building, San Francisco

ELECTUS
D.
LITCHFIELD
Architect

The South, or Rear Entrance of the St. Paul Public Library at St. Paul, Minnesota, another fine example of the use of Tennessee marble for the exterior.

GRAY KNOX MARBLE COMPANY

KNOXVILLE :: :: TENNESSEE

Offices in New York and Chicago

TENNESSEE MARBLE
ENTRANCE

to the

MARINE NATIONAL BANK
BUFFALO, N.Y.

This illustration is from an unretouched photograph taken this year. The entrance was erected by us in 1914—a period of 11 years. The marble has not been cleaned since it was put in place.

GEO. W. MALTBY & SONS CO.
21 MARYLAND STREET · BUFFALO, N.Y.

MANCHESTER NATIONAL BANK, MANCHESTER, N.H.

7/8" marble veneering was used for facing this old brick building. Troy Bros. & Co. installed the marble. The architect was C. R. Whitcher.

TROY BROTHERS & CO.
Interior Marble Work
975 MASSACHUSETTS AVE. BOSTON, MASS.

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ON the following pages will be found a list of the Quarries and Marble Manufacturers represented in the membership of the National Association of Marble Dealers.

LIST OF QUARRIES AND MARBLE MANUFACTURERS

REPRESENTED IN THE MEMBERSHIP OF THE

NATIONAL ASSOCIATION OF MARBLE DEALERS

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Knoxville, Tenn.	Tennessee Producers Marble Co.	B. L. Pease
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Omaha, Neb.	Sunderland Bros. Company	J. P. Williams
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St. Paul, Minn.	Drake Marble and Tile Company	W. E. Andrews
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